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Technology-Enriched Universal Design for Learning Strategies in Postsecondary Education

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TECHNOLOGY-ENRICHED UNIVERSAL DESIGN FOR LEARNING STRATEGIES IN POSTSECONDARY EDUCATION

by

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Dedication

For bestowing a foundation of perseverance and determination, this dissertation is dedicated to my parents, Mr. and Mrs. David Josey, and grandparents, Dr. and Mrs. Harrell Josey, and Mr. and Mrs. John McClure. I am privileged beyond words to have been influenced and inspired by such tenacious, selfless individuals in my life.

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Abstract

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While studies on technology professional development (PD) report the need for faculty to remain current in their knowledge of instructional technologies, relatively few promote the capabilities of such technologies to assist faculty in implementing Universal Design for Learning (UDL) principles (Higbee, 2008; Levy, 2009; Wilson & Wright, 2011). Likewise, very few studies have highlighted the perceptions of faculty about UDL and how these perceptions influence practice and the implementation of such principles. The purpose of this study was to examine the perceptions of faculty who had participated in an online module on technology-enriched UDL strategies, and how this participation impacted perceptions about the needs of students with disabilities (SWDs), the application of technology to meet the needs of SWDs, and the application of technology-enriched UDL strategies to meet the needs of SWDs. A qualitative case study was conducted with five faculty members who taught lower-division undergraduate language courses. This study revealed faculty perceptions related to the following three themes: awareness of learner variability and challenges faced by SWDs, benefits and barriers of applying technology-enriched UDL strategies, and the impact of UDL-focused PD on perception and practice. Findings suggested, after participating in an online module on technology-enriched UDL strategies, participants perceived: (a) SWDs need to be accommodated, but may not always disclose learning needs, (b) SWDs and all learners need materials in multiple, accessible formats, (c) technology reduces barriers to learning, (d) technology enables customization and self-regulation of learning, and (e) technology-enriched UDL strategies are beneficial. Findings also indicated the online module may have had an impact on these perceptions.

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Chapter 1: Introduction

Universal Design for Learning (UDL) is a set of guidelines that considers the learning needs of all students, including students who, according to the Center for Applied Special Technology (CAST), were once considered in "the margins of our educational systems, but are now recognized as part of the predictable spectrum of variation" (CAST, 2015). Multiple studies have highlighted the benefits of integrating UDL principles as a means of addressing learner variability (McGuire, 2011; Scott & Edwards, 2012; Scott, Hildebrandt, & Edwards, 2010; Yuval, Procter, Korabic, & Parker, 2004). A number of studies have also been conducted to explore the perceptions of faculty about the UDL framework (Izzo, 2008; Myers, 2008; Skinner, 2007). Such studies have indicated professional development (PD) focused on UDL principles is likely to result in increased awareness and application of inclusive instructional strategies (Higbee, 2008; Langley-Turnbaugh, Blair, & Whitne, 2013; LaRocco & Wilken, 2013; Moreno, 2013; Spooner, Baker, & Harris, 2007; Scott & Edwards, 2012). In addition, as a result of familiarity with the UDL framework, faculty may be more likely to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007). As UDL is a framework designed to be inclusive of all learners (Chita-Tegmark, Gravel, Serpa, Domingo, & Rose, 2012; Orr, 2009), it may serve as a viable framework for technology integration and inclusive teaching in the postsecondary setting.

Legislation such as the Higher Education Opportunity Act of 2008 and the Americans with Disabilities Act of 2008 have led to an increased interest in research related to accessibility in higher education (Raue & Lewis, 2011); however, relatively

few studies have promoted the application of UDL as a means of meeting the needs of students with disabilities (SWDs) in the postsecondary setting. The goal of this study is to examine the perceptions of faculty about technology-enriched UDL strategies and whether such strategies may serve as a helpful framework for addressing the needs of SWDs in the postsecondary classroom.

Statement of the Problem

The population of SWDs attending four-year institutions has steadily increased over the course of two decades (Higher Education Statistics Agency, 2003; Gregg, 2007; Orr, 2009). Previous studies indicated SWDs comprised approximately 3% of the population of college students (Scott et al., 2000), while more recent data has shown SWDs may comprise over 11% of the total student population (U.S. Government Accounting Office, 2009; National Center for Educational Statistics, 2006). With the growth of this population in the postsecondary setting in recent years, faculty and support staff may be likely to work with SWDs (Okolo & Diedrich, 2014). As a means of meeting the needs of SWDs, institutions may also create separate classes or implement a section specifically for students with special learning needs (Block, Brinckerhoff, & Trueba, 1995; Scott et al., 2012). Institutions may also implement policy changes such as course waivers (Scott et al., 2012); however, these waivers may only be provided in exceptional circumstances, or after the student has unsuccessfully attempted to complete the course (AHEAD, 2006).

For this reason, SWDs must often persist in challenging courses and may suffer embarrassment, stress, and anxiety (Scott et al., 2010). Likewise, while institutions typically offer support to assist SWDs, these students may not always request

accommodations due to self-perceptions of their disability (Scott et al., 2010). In a study by Orr (2009), when asked about their expectations for graduation, only 25% of students with documented learning disabilities indicated they intended to complete their degree. As students with learning disabilities comprise the largest group of documented SWDs (Orr, 2009), such needs may also be left undisclosed to faculty. As a result, many SWDs often remain unreported or undocumented (Barnard-Brak, Paton, & Sulak, 2012), and may not receive the support needed to remain academically successful.

As a result of legal issues surrounding the accommodation of SWDs, many institutions have adopted accessibility standards that have led to significant changes in the way instructional materials and technologies are integrated. However, despite both legislation and a wealth of literature that mandate and support the accommodation of all learners through technology, innovative resources and multimedia content are often reduced to supplementary materials with text as the primary mode of delivery (Berberi, Hamilton, & Sutherland, 2008). In addition, while research has shown faculty may regularly apply more than one instructional method, there remains a need for growth in how they incorporate multimodal instruction as a means of differentiation (Higbee, 2008). Studies have also revealed a disparity between faculty attitudes toward inclusive instruction and whether they authentically demonstrate inclusive practices in their teaching (Gawronski, 2014).

Purpose of the Study

While studies on technology PD report the need for faculty to remain current in their knowledge of instructional technologies, relatively few promote the capabilities of such technologies to assist faculty in implementing UDL principles (Higbee, 2008; Levy,

2009; Wilson & Wright, 2011). As noted by Meyer and Rose (2005), "UDL can help us move past the early-stage, old-use applications of new learning technologies, and change the outdated, print centric assumptions underlying current educational practice" (p. 9). By aligning technology integration to the UDL framework, faculty may more effectively address two key issues pertaining to learner variability: individual characteristics or disabilities which interfere with the learner's ability to access content, engage in a course, or demonstrate knowledge, and issues resulting from how the learning environment was designed (Rose, Harbour, Johnston, Daley, & Abarbanell, 2006).

While there is a growing body of literature on UDL in the postsecondary setting, relatively few peer-reviewed studies have highlighted the results of faculty development initiatives that explicitly address the UDL framework. A search for "Universal Design for Learning" and "faculty professional development" within the body of articles among relevant journal databases revealed only 13 peer-reviewed studies. A search for UDL and "faculty development" within the body of articles revealed 86 peer-reviewed publications of 2733 peer-reviewed publications on Universal Design for Learning. Of these publications, a small percentage appeared to explicitly address the focus of faculty PD opportunities on UDL. The remaining articles appeared to mention faculty development within the body of the publication, but may not have explicitly addressed the impact of UDL-focused interventions. For this reason, a study on faculty perceptions of technology-enriched UDL strategies may provide valuable insight into the current practices of faculty who teach SWDs and ways in which technology can be used more proactively to address the needs of SWDs in the postsecondary classroom. The purpose of the proposed study is to examine the perceptions of faculty about (a) the needs of SWDs, (b) the application of technology to

meet the needs of SWDs, and (c) technology-enriched UDL strategies. Subsequently, this study aims to:

- communicate the need for UDL-focused PD in the postsecondary setting;
- promote UDL as a domain of knowledge and support for accessibility standards and guidelines required in the postsecondary setting;
- and promote UDL as a means of proactively designing learning environments reducing dependency on the accommodation process.

With these goals in mind, this study communicates the need for faculty to acquire knowledge of UDL and implement UDL as a means of meeting the needs of SWDs and all learners. From the findings in this study, considerations may be made for UDL-focused PD; this study is not designed, however, to address the effectiveness of individual UDL-focused PD opportunities such as the online module required for participation in the study.

It should be also noted that UDL involves systematic design around multiple key domains, all of which cannot be addressed in a single study. The integration of technology is just one of the domains addressed within UDL research; these ideas cannot be discussed separately from the need for methodologies that require technology as well as best practices for curriculum design. As the UDL framework is multi-faceted, and understanding about the framework highly contextual, this presents several challenges in the discussion of research surrounding UDL. In addition, while previous literature has addressed both Universal Design for Access (UDA) and Universal Design for Instruction (UDI), these frameworks are distinct from UDL and focused primarily on the perception of instruction and materials and usability; for this reason the study focused explicitly on

UDL. Both perceptions about the framework as well as studies surrounding the framework could hold a wealth of implications for institutional policies surrounding accessibility, models for instructional design and technology integration, faculty development initiatives surrounding accessibility and UDL, and studies on the impact of universally-designed instruction and learner success. While there may be a number of approaches to such studies on UDL, the focus of this particular study is on the emergence of faculty perceptions about the needs of SWDs, the application of technology to meet the needs of SWDs, and technology-enriched UDL strategies.

With these foci in mind, this study may provide insight for a variety of individuals involved in the development of accessibility policy, faculty training, and UDL initiatives, including instructional designers and consultants who lead faculty development opportunities, policy-makers, and higher education administrators who oversee implementation of accessibility standards. Resulting from the study is an emergence of knowledge about how the study participants perceived the needs of SWDs, the application of technology to meet the need of SWDs, and technology-enriched UDL strategies. While the findings of this study cannot be generalized to other populations, the emerging themes may reveal implications for future research, and, subsequently, offer insight into key areas and domains of UDL that should be addressed by institutional policy and future initiatives to implement UDL-focused PD in the postsecondary setting.

Research Questions

This study evaluated the perceptions of lower-division undergraduate foreign language faculty who completed an online module on technology-enriched UDL strategies. In order to identify the perceptions of each of the participants who participated

in an online module on technology-enriched UDL strategies, the following questions were addressed:

1. After completing an online module on technology-enriched UDL strategies, what are the perceptions of faculty about the needs of SWDs?
2. After completing an online module on technology-enriched UDL strategies, what are the perceptions of faculty about application of technology to meet the needs of SWDs?
3. After completing an online module on technology-enriched UDL strategies, how do faculty consider applying technology to address the needs of SWDs?
4. After completing an online module on technology-enriched UDL strategies, what are the overall perceptions of faculty about technology-enriched UDL strategies as a framework for addressing the needs of SWDs?

Significance of the Study

As a model in which SWDs "are seen as part of a continuum of learners with various strengths and weaknesses" (Orr, 2009), UDL may serve as a viable framework for inclusive teaching and technology integration within the standard classroom. Likewise, the principles of UDL are designed to be inclusive of all learners (Chita-Tegmark et al., 2012). Several studies have also highlighted the benefits of integrating UDL principles in the postsecondary classroom (McGuire, 2011; Scott & Edwards, 2012; Scott et al., 2010; Yuval et al., 2004). Such benefits include: narrowed grade distribution and withdrawal rates (McGuire, 2011); increased success rates (Scott & Edwards, 2012); clearer expectations; more flexibility; and perceived instructor approachability (Scott et al., 2010). However, publications on programs that model accommodations may be

limited in data or may not have been recently conducted (Skinner & Smith, 2011). Likewise, previous research has been historically centered on the architectural principles of Universal Design rather than pedagogical research (McGuire, Scott, and Shaw, 2004).

A number of studies have also highlighted positive results from PD models that explicitly address UDL (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco & Wilken, 2013; Moreno, 2013; Scott et al., 2000; Scott & Edwards, 2012; Spooner et al., 2007). These benefits include:

- increased awareness of learner diversity and ability to accommodate diverse learners (Scott & Edwards, 2012);
- increased likelihood to apply inclusive teaching practices;
- increased awareness of the importance of individual differences (Moreno, 2013);
- adjustments to the way courses are designed and delivered (Langley-Turnbaugh et al., 2013);
- increased comfort level in accommodating students with disabilities (Higbee, 2008);
- the creation of new, actionable support programs for individual academic departments (Scott et al., 2000);
- and more frequent multimodal delivery of instruction (Langley-Turnbaugh et al., 2013).

Such development opportunities may encourage faculty to design accessible instruction proactively, rather than providing accommodations after instruction has been implemented (Spooner et al. 2007). This research also substantiates the need for faculty to remain current in their knowledge of technology and how technology can be used to

support SWDs. However, previous studies on technology PD models have indicated technology competency alone has little to no effect on the instructional process; and education can only be reformed through the way in which technology is used (Koehler & Mishra, 2005). As UDL is a model designed to be inclusive of all learners (Chita-Tegmark et al., 2012; Orr, 2009), and SWDs may learn more readily with multimedia-rich approaches than with more traditional methodologies (Kennedy, Thomas, Meyer, Alves, & Lloyd, 2014), UDL may serve as a viable framework for technology integration, multimodal instruction, and inclusive teaching in the postsecondary classroom.

Definitions

For the purposes of the literature review and the study, definitions are provided below:

Universal Design for Learning. Universal Design for Learning (UDL) is a framework centered on the process of learning, as opposed to other domains of Universal Design (UD), which focus primarily on technology usability and functionality. Accessibility experts in education have referred to a modified version of the nine UD principles in recent years to address the needs of disabled students in physical, blended, and online classrooms. However, UDL has emerged more recently as an authentic application of UD principles to the fields of cognitive science and instructional design. Literature and existing initiatives tend to focus on UDL as a framework for making instruction more accessible to SWDs. For the purposes of this study, the Center for Applied Technology's (CAST, 2015) definition of UDL will be applied - "an educational framework that guides the design of learning goals, materials, methods, and assessments

as well as the policies surrounding these curricular elements with a diversity of learners in mind."

Technology-enriched UDL strategies. UDL serves as a framework for the design of instructional materials, methods, and assessment inclusive of all learners. For the purposes of this study, technology-enriched UDL strategies will be defined as instructional methods that leverage technologies and digital resources in the design of inclusive instruction.

Postsecondary education. For the purposes of this study, postsecondary education will be defined as an undergraduate education beyond high school, in a community college setting or four-year institution.

Students with disabilities. The Americans with Disabilities Act (2009) defines a person with a disability as: (a) someone who has an impairment that limits one or more major life activities; (b) an individual with a history or record of such impairments; or (c) an individual who is perceived to have such impairment. The National Center on Educational Statistics (NCES) published a study in 2011, in which disability was defined as "a physical or mental condition that causes functional limitations that substantially limit one or more major life activities including mobility, communication (seeing, hearing, speaking), and learning" (p.12). Of all disability types, a majority of the institutions reported enrolling students with the following: specific learning disabilities, Attention Deficit Disorder (ADD)/ Attention Deficit Hyperactivity Disorder (ADHD), mobility limitations, and mental illness/ psychological/ psychiatric conditions (Raue & Lewis, 2011). Of the distribution of disabilities among students with disabilities (SWDs) at four-year institutions, specific learning disabilities (29%) and ADD/ADHD (23%)

were the most commonly reported. While the intent of UDL is to address the needs of all learners, SWDs will be defined in this study as students with a specific learning disability and/or ADD/ADHD in order to target the highest reported and, potentially, most underserved SWD population. While additional disabilities may be implied by the term SWD, the literature review and report of research will not explicitly address other disability types.

Learner variability. According to Rose et al. (2002), "One of the clearest and most important revelations stemming from brain research is that there are no 'regular' students. The notion of broad categories of learners—smart, not smart; disabled, not disabled; regular, not regular—is a gross oversimplification that does not reflect reality. By categorizing students in this way, "we miss many subtle and important qualities and focus instead on a single characteristic" (p. 38). Likewise, previous research suggests the average or typical learner does not exist (Meyer & Rose, 2005); instead, learners may vary as significantly as the "the interactions among modules in our brains" (Gardner, 1983). For this reason, the term *learner variability* is commonly used in literature identifying UDL as a guide for meeting the needs of all learners, regardless of disabilities or special needs.

Chapter 2: Review of Literature

In order to better understand the current state of research on UDL relevant to the study and research questions, the following key areas will be discussed: (a) the needs of SWDs, (b) emergence of UDL as a framework for meeting the needs of students with disabilities (SWDs), (c) benefits and barriers to UDL as a framework for technology integration and meeting the needs of SWDs, and (d) rationale for UDL as a framework for technology integration and meeting the needs of SWDs.

This review of literature was conducted by identifying the topic of technology-enriched UDL strategies in the postsecondary setting, identifying keywords related to the topic, and searching within articles for related studies. Peer-reviewed studies that explicitly address UDL-focused PD in the postsecondary setting are limited and required a review of research within the broader domains of UDL in higher education. For this reason, searches often included a combination of two or more of the following key terms: Universal Design for Learning, UDL, Universal Design, UD, UDI, postsecondary education, higher education, faculty development, professional development, accessibility, and technology integration. Searches were also conducted for publications by the most prominent researchers in the field.

Universal Design for Learning

Described below is an overview of the emergence of UDL from UD, differences between UDL and UD, and Universal Design for Learning.

Emergence of UDL from UD. Universal Design emerged in the field of architecture out of a need to design buildings to be accessible to people with disabilities. Such principles were applied by architects to design structures that accommodate a broad

variety of individuals as well as individuals with disabilities. As buildings that were universally-designed were seen as superior to buildings that were retrofitted to accommodate accessibility needs, architecture schools began incorporating Universal Design as a domain of knowledge for architects (Rose, 2000). At the Center for Applied Special Technology (CAST), educators began to recognize a need for universally-designed materials as a way to meet the needs of students with cognitive, physical, and sensory disabilities. As students with varied learning needs require multiple formats, assistive technologies provide better access to such materials (Hitchcock & Stahl, 2003; Rose, 2000;). For example, a student with dyslexia may have difficulty in decoding words, or a student with a visual impairment may be unable to see standard-sized text. Such technologies, however, were often expensive and difficult to use. As a means of increasing ease of access to accessible learning materials, CAST began developing electronic versions of books with built-in access to optional technologies such as text-to-speech software (Rose, 2000).

Publications on these initiatives also indicated these features were useful for all learners, and not just learners with disabilities, as noted by teachers who observed both students with and without disabilities using text-to-speech software. With this observation in mind, CAST began work on a literacy program with built-in features accessible to students with disabilities (Rose, 2000). During this time, an architect on the CAST board, Ronald Mace, introduced the organization to Universal Design. CAST then began applying UD principles in the design of instructional materials, assessments, and methods; however "because access to information and access to learning are different,"

CAST ultimately created the Universal Design for Learning framework to differentiate the two (Rose, 2000).

Difference between UD and UDL. The phrases "access to learning" and "access to information" are commonly confused; by doing so, educators may assume Universal Design for Learning can be holistically accomplished in educational environments by designing materials that are more accessible alone (Rose, 2000). However, UDL and Universal Design for access are distinct frameworks (Boone & Higgins, 2007; Rose, 2000). However, UDL suggests it is not enough for students to just access materials and information. While UDL may have emerged from the UD movement, it specifically focuses on the design of more engaging and accessible learning environments, not just to provide information (Basham, Israel, Graden, Poth, & Winston, 2010; Rose et al., 2006; Rose & Meyer, 2002). For this reason, it is not sufficient to provide access to information, but also focus on accessible pedagogy (Rose et al., 2006). The difference between UD for access and UDL is in the goals:

> The professional mover aims to move heavy objects with the least investment of effort and the greatest efficiency. Hence, he uses a dolly or an electronic lift. The athlete in training aims to build muscle. Hence she supports the muscles not being trained and lifts heavy weights with the target muscles. The learner more resembles the athlete than the professional mover. Education is an exercise in constructing knowledge and skills. It requires a careful balance of support and resistance. Thus Universal Design for access provides the greatest amount of support possible at all times, while Universal Design for Learning requires careful attention to the goals of any given learning experience so that a balance of challenge and support can maximize the learning opportunity. (Rose, 2000, p. 67)

While UDL focuses on the idea of flexible instruction and the provision of alternative methods that fit the needs of a variety of learners, it is often misinterpreted as a one-size-fits-all model for designing instruction (Rose, 2000). Unlike with Universal Design for access, the term "universal" in the context of UDL refers to individual differences among

learners. UDL recognizes learners do not differ along a single spectrum, but, instead, differ across the many specialized components of the brain. UDL provides a framework that addresses this need by offering alternative methods of instruction rather than a single solution (Rose, 2000).

What is Universal Design for Learning? "[The brain] is not one universal or general-purpose learning device but rather a toolbox filled with many different kinds of neural learning tools, each devoted to a specific purpose" (Rose, 2000). Research in the cognitive sciences revealed the need to understand the brain as an organ of many components with specialized and individual purposes (Rose, 2000). For this reason, UDL is distinct from other areas of UD in that it focuses specifically on the learning process and addresses the following key principles: multiple means of representation, multiple means of expression, and multiple means of engagement (Rose et al., 2006). These three principles of the UDL Guidelines (Figure 1) were identified based on the following three components of the brain: recognition networks, which facilitate the recognition of objects and patterns in external environments; strategic networks, which generate effective patterns of action and response; and affective networks, which evaluate the significance of patterns (Rose et al., 2006). These principles are described in more detail below.

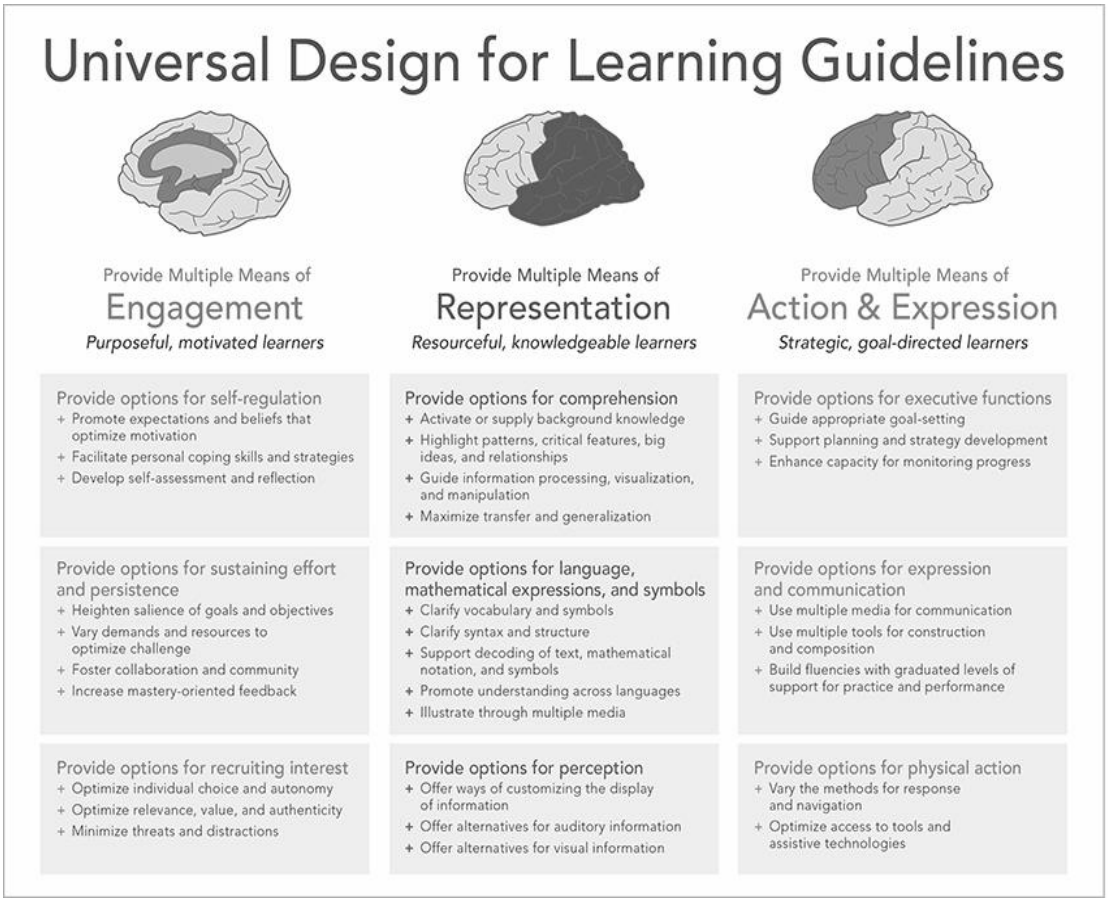

Figure 1. Universal Design for Learning guidelines, from udloncampus.cast.org (CAST, 2015).

Multiple means of representation. The first principle recognizes learners are variable in the way they comprehend and perceive information presented to them. However, simply making such materials accessible is not enough. For this reason, this principle also addresses means of teaching students how to use and organize information, rather than simply accessing information (Rose et al., 2006).

Multiple means of action and expression. The second principle suggests students vary in the way that express what they know and navigate the learning process. It takes into account that students can more successfully express their learning when more than one medium is provided. This principle also suggests various supports and scaffolds be provided to support student learning, and that feedback is essential to learning as well. In

other words, the same form of expression or method of support will not work for all learners (Rose et al., 2006).

Multiple means of engagement. The third principle suggests learners vary in the ways they are motivated to learn and in the ways they engage in the learning process. This principle also suggests motivation will better prepare students for success than external methods.

> The ways in which faculty teach the discipline and curiosity that their fields require, the often subtle rewards of accomplishment and choice, and many other aspects of disciplinary self-regulation -- these, too, need to be modeled and supported in ways that are attainable by students with very different emotional and attitudinal histories (Rose et al., 2006, p. 137).

In other words, the engagement principle suggests it is not feasible to engage all learners with the same extrinsic rewards, and learners do not maintain the same intrinsic motivation "along the same path" (Rose et al., 2006).

Emergence of UDL in Postsecondary Education

In 2008, the Center for Applied Special Technology (CAST) collaborated with the US Dept. of Education to form three basic guidelines for education based on UDL principles: multiple means of representation, multiple means of expression, and multiple means of engagement (Rose et al., 2006). These principles are important reminders of why merely making classrooms or textbooks accessible is not enough (Rose et al., 2006). Previous studies on UDL have indicated successful learning environments should provide a means for students to act on information, engage and motivate learning, and provide supports that are accessible to all learners, not just those with disabilities (Rose, 2006). Meyer and Rose (2005) suggest, "when education fails, the curriculum, not the learner, should take responsibility for adaptation" (p. 20). Likewise, UDL provides a model of

disability that is more inclusive in which SWDs "are seen as part of a continuum of learners with various strengths and weaknesses" (Orr, 2009).

More recently, UDL has emerged in the postsecondary setting as a set of guidelines that, according to CAST (2015), provide equal learning opportunities for all students and a flexible and adjustable approach to designing instructional materials, assessments, and methods that "work for everyone" (CAST, 2015). This framework is based on a model of learning that accounts for learner variability, inclusive of students who were once marginalized but are "now recognized as a part of the predictable spectrum of variation" (CAST, 2015). With learner variability in mind, UDL promotes:

- Translation of research into practice - UDL may be able to change teaching and learning by promoting the design of flexible instruction that takes into account the multiple variables related to the context in which learning occurs.
- Including the learner in the process of learning - UDL promotes the encouragement of students to be more involved, to communicate their learning needs, and to guide their own learning.
- Integration of digital technologies - While such technologies should not be the only method for implementing UDL, they do help to promote cost-effective, flexible ways to individualize learning (CAST, 2015).

The primary focus of UDL is on the removal of barriers through proactively designing for a diverse learner population rather than providing an adaptation on an individual basis. "Because its users are whole communities, universally-designed environments are engineered for flexibility and designed to anticipate the need for alternatives, options, and adaptations to meet the challenge of diversity" (Rose et al., 2006). The focus of UDL is

on engaging students in active learning, with the goal of helping all students become expert learners (Basham & Marino, 2013). Likewise, UDL suggests variability is a rule and not an exception to the norm among the learner population (CAST, 2015).

In order to better understand the need for more research on UDL in the postsecondary setting, as well as similarities among studies in both settings, an overview of the emergence of UDL from K-12 to postsecondary education is described in this section. Although UDL is founded on a history of disability studies in the education setting, peer-reviewed research and resources on UDL in the postsecondary environment remain emergent. However, policies in both the K-12 and postsecondary environment suggest there is a need to design inclusive instruction. Likewise, the strategies behind the design of inclusive instruction are similar in both environments. In an effort to identify ways in which UDL has emerged in postsecondary education, this section includes a description of: (a) chronological development of UDL initiatives, (b) identification and comparison of disability requirements in both settings, and (c) several examples and comparison of studies in both domains.

Background of UDL. Described in Table 1 is a chronological overview of: (a) legislation and accessibility requirements, (b) emergence of UDL research and resources, and (c) recent UDL initiatives in the postsecondary setting. It should be noted that, while accessibility laws and research on UD have been established for decades, UDL only recently emerged as a framework for addressing the needs of learners in the postsecondary setting. The following timeline explicates how UDL began to emerge among requirements to meet the needs of individuals with disabilities.

Table 1

Background of UDL

Date	Description
1973 - Section 504 of the Rehab. Act of 1973	Section 504 was the first legislation passed that made it illegal to discriminate against persons with disabilities. This act applied to any institution or organization receiving federal funds, including universities, contractors, and federal agencies.
1987 - Principles for Effective Practices in Undergraduate Education	Arthur Chickering, professor of Higher Education at Memphis State University (now the University of Memphis), and Zelda Gamson, sociologist at the University of Massachusetts-Boston and the University of Michigan, developed seven principles for effective practices in undergraduate education. The principles were as follows: (a) encourages contact between students and faculty, (b) develops reciprocity and cooperation among students, (c) encourages active learning, (d) gives prompt feedback, (e) emphasizes time on task, (f) communicates high expectations, and (g) respects diverse talents and ways of learning (Chickering & Gamson, 1987).
1988 - Equal Access Program	The Center for Applied Special Technology (CAST) developed the Equal Access Program as a means of ensuring access to curriculum for SWDs through technology. The focus of this program, proactive curriculum adjustments over accommodations, would ultimately lead to the conceptualization of Universal Design for Learning.
1990 - Americans with Disabilities Act (ADA)	The Americans with Disabilities Act, passed in 1990, increased public awareness of the civil rights of persons with disabilities and prohibited discrimination of persons with disabilities in the following areas: services, programs, telecommunications, employment, and places of public access (Americans with Disabilities Act, 1990). In response to this legislation, the Architectural and Transportation Barriers Compliance Board developed the ADA Standards for Accessible Design ("1991 ADA Standards," 2010).

Table 1 (Continued)

Background of UDL

Date	Description
1990 - Universal Design (UD)	Ronald Mace at North Carolina State University established the Center for Accessible Housing (now the Center for Universal Design) with federal funding in 1989. At the time, the Center served as a leading resource for research on the universal design of products, architecture, and housing. In 1990, Mace conceptualized Universal Design (UD) as an approach to design that accommodates persons of varying sizes, ages, and abilities (Mace, Hardie, & Place, 1991).
1990 - Individuals with Disabilities Education Act (IDEA)	The Individuals with Disabilities Education Act (IDEA) was passed to ensure SWDs were provided with free public education that accommodated their individual needs. The six pillars of the IDEA Act included: (a) individualized education programs, (b) free public education, (c) least restrictive environment, (d) appropriate evaluation, (e) parent and teacher participation, and (f) procedural safeguards.
1995 – Universal Design for Learning (UDL)	After a decade of research on the use of technologies to improve the learning experiences of SWDs, the Center for Applied Special Technology (CAST) began to conceptualize the UDL Framework through presentations and publications. During this time, CAST also won its first grant from the U.S. Department of Education for their proposal "Beyond Assistive Technology."
1997 – The Seven Principles of UD	Apart from research emerging at CAST, the Center for Universal Design in Raleigh, North Carolina, launched the Principles of Universal Design to guide the design of accessible architecture and products. The seven principles were as follows: (a) equitable use, (b) flexibility in use, (c) simple and intuitive, (d) perceptible information, (e) tolerance for error, (f) low physical effort, and (g) size and space for approach and use (Connell, Jones, Mace, Mueller, Mullick, Ostroff, & Venderheiden, 1997).

Table 1 (Continued)

Background of UDL

Date	Description
2002 – Universal Design for Instruction (UDI)	After a thorough review of literature on effective teaching in higher education, including (a) Chickering and Gamson's guidelines for good practice in undergraduate education (1987), (b) guidelines for inclusive teaching in the K-12 setting (CAST, 1999), and (c) six major features of effective instruction (Kame'enui & Carnine, 1998), the Center on Postsecondary Education and Disability launched the nine Principles of UDI. The center also recruited faculty to submit examples of instructional methods, which then informed the development of these principles. After a thorough peer-review process, the following nine principles were proposed: (a) equitable in use, (b) flexibility in use, (c) simple and intuitive, (d) perceptible information, (e) tolerance for error, (f) low physical effort, (g) size and space for approach and use, (h) community of learners, and (i) instructional climate (Scott, McGuire, & Embry, 2002).
2006-2007 - National recognition of UDL	Over the course of several years, CAST launched a number of tools and resources for K-12 education, which helped UDL become more widely and nationally recognized. Initiatives included: (a) the *UDL Book Builder* and *UDL Lesson Builder*, two free web-based tools for educators; (b) *A Practical Reader in Universal Design for Learning*, published by Harvard Education Press; (c) Project Monitor, a research project with over 800 students to examine the combination of UDL and curriculum-based measurement; and (d) the National UDL Taskforce, comprised of over fifteen organizations with the goal of strategically promoting Universal Design for Learning in practice.

Table 1 (Continued)

Background of UDL

Date	Description
2008 - UDL Guidelines	After several years of disability research in education and emerging research on UDL, CAST issued the first version of the UDL Guidelines. Additional initiatives occurring that year included: (a) the publication of *UDL Editions*, an online reading resource for K-12 education; (b) formation of the National UDL Center to provide leadership in UDL policy, research, and practice; and (c) publication of the first UDL definition in the Higher Education Opportunity Act, which established guidelines for UDL implementation in post-secondary settings as well as pre-service teacher preparation.
2009-2014 - Continued UDL Initiatives	Over the course of the next five years, UDL would continue to gain recognition through publications, research, and resources for educators. Although research and policies on UDL in the postsecondary setting began to emerge, many of these resources and initiatives were built on a history of research related to accessibility issues and instructional strategies in the K-12 setting. Initiatives and publications from this time period include: (a) UDL Online Modules for preservice teachers; (b) *A Policy Reader in Universal Design for Learning*; (c) The National Educational Technology Plan; (d) revised UDL Guidelines 2.0; (d) *Universal Design for Learning in the Classroom: Practical Applications*, (e) The UDL Curriculum Toolkit; (f) The UDL Studio, (g) UDL Exchange, a community established for educators, and (h) *Universal Design for Learning: Theory and Learning.*
2014 - UDL on Campus	CAST's first comprehensive resource for UDL in higher education, UDL on Campus, was launched late 2014 and redesigned in 2015 to include substantive examples and resources for postsecondary implementation. The goal of UDL on Campus is to assist postsecondary educators with curriculum design and technology integration through the lens of UDL.
2015 - 1st Annual UDL Symposium	Also launched in 2015 was CAST's first annual UDL symposium, "Building Community around UDL: From Theory to Practice." Sessions included: (a) UDL design

for learner variability; (b) UDL implementation in schools, districts, states, and higher education settings; (c) assistive technology, accessible materials, and the UDL Principles; (d) student engagement and data visualization; (e) affect and engagement; and (f) UDL in higher education.

UDL in K-12 and postsecondary studies. UDL was conceptualized as a result of extensive research in accessibility and special education; however, a majority of these studies have been conducted in the K-12 environment. While postsecondary studies continue to be emergent, it should be noted that studies in both settings have indicated UDL implementation benefits learners in a number of ways: UDL may increase student engagement, UDL encourages the use of more than one format, UDL-aligned materials benefit both students with and without disabilities, and students may have positive perceptions about UDL-aligned materials. Examples of such studies in both environments are described below.

Table 2

Studies on the Impact of UDL-Aligned Materials

Title of Study	Description
UDL in the middle school science classroom: can video games and alternative text heighten engagement and learning for students with learning disabilities? (Marino, Gotch, Israel, Vasquez, & Basham, 2014)	The authors examined the performance of 341 middle school students both with and without disabilities in inclusive classrooms that alternated between the incorporation of traditional materials and materials more closely aligned to UDL such as video games and alternative texts; 57 of these students, according to IEPs, classified as students with learning disabilities. The results of the study suggested supplemental texts and the video games provided both multiple means of representation and expression, and that units aligned to UDL also led to more student engagement. For example, several students, according to the author, expressed a preference toward the video games and reported collaboration with peers, and a majority of students with learning disabilities indicated they would prefer to play a game than take a test. However, there did not appear to be significant differences on posttest scores between students with and without learning disabilities, which suggests both students with and without disabilities alike may equally benefit from UDL-aligned materials. (Marino et al., 2014).
Using evidence-based multimedia to improve vocabulary performance of adolescents with LD: a UDL approach (Kennedy, Thomas, Meyer, Alves, & Lloyd, 2014)	The authors designed and implemented an instructional tool called a content acquisition podcast (CAP), designed according to the UDL framework, to provide vocabulary instruction to approximately 109 general education students, including 32 SWDs. Of the SWDs, 84% were students with learning disabilities. Results suggested scores of two posttests and weekly vocabulary matching assessments for all students were 2.67 points higher during the time they were exposed to the intervention. Results also indicated both students with and without disabilities scored higher on the posttests and demonstrated significant growth on weekly vocabulary assessments when CAPs were provided. (Kennedy et al., 2014).

Table 2 (Continued)

Studies on the Impact of UDL-Aligned Materials

Title of Study	Description
Analyzing a college course that adheres to the universal design for learning (UDL) framework (Smith, 2012)	In this study, researchers observed graduate students in two sections of a research methods course taught by faculty who had participated in an orientation to the principles of UDL. The course observed was taught with the three aspects of learning addressed by UDL as a guide: recognition learning, strategic learning, and affective learning. As a part of the course planning process, the instructor utilized a UDL implementation checklist as a method of aligning course objectives with UDL guidelines. At the beginning of each semester, 80 graduate students were provided an overview of the UDL principles and completed a survey on perceptions of UDL. The survey was designed to address how consistent the faculty was in addressing UDL from the perspective of the student. Results of the study showed there was a statistically significant relationship between UDL implementation and student engagement and interest (Smith, 2012).
Accessible by design: applying UDL principles in a first year undergraduate course (Kumar & Wideman, 2012)	In this study, the authors observed technology-enhanced undergraduate courses in which the UDL framework was applied, and students were interviewed at the end of the semester to determine how the UDL aspects of the course impacted perceptions of accessibility. As a result, students perceived they had more opportunities to make choices and take control of their own learning. The design of the course, according to UDL, also reduced the need for accommodation by disability services (Kumar et al., 2014).

Table 2 (Continued)

Studies on the Impact of UDL-Aligned Materials

Title of Study	Description
Measuring the effectiveness of universal design for learning intervention in postsecondary education (Davies, Schelly, & Spooner, 2013)	This study was designed to measure the effectiveness of faculty development on the principles and implementation of UDL. A UDL questionnaire designed to measure student perceptions of instructional methods was distributed to students both pre and post training. Results of the study indicated faculty training on UDL may have a significant effect on students' perceptions of instructional methods. According to the student survey, the areas most significantly impacted by the UDL training were: (a) multiple formats of presentation, (b) relating key concepts to course objectives, (c) outlines provided for each lecture, (d) summarization of each lesson, (e) organized and accessible course materials, and (f) use of videos (Davies et al., 2013).
Universal design for learning and instruction: perspectives of students with disabilities in higher education (Black, Weinberg, & Brodwin, 2015)	A study was conducted a study to identify whether or not student perspectives aligned with UDL, and which needs expressed by students could not be addressed by UDL (Black et al., 2015). Themes in the interviews included: understanding the material, ability to express knowledge, and preferences for UDL principles. Preferences for UDL principles were most frequently discussed among student with learning disabilities and cognitive disabilities (Black et al, 2015). Students also appeared to agree that learning was more readily achieved by instructors who applied a variety of methods and tools aligned to UDL guidelines (Black et al., 2015). The authors also acknowledged that accommodations did not always match the needs of some students, while UDL considered instructional materials and curriculum design inclusive of all students (Black et al, 2015).

Table 2 (Continued)

Studies on the Impact of UDL-Aligned Materials

Title of Study	Description
Universal design for instruction and learning: a pilot study of faculty instructional methods and attitudes related to students with disabilities in higher education (Black, Weinberg, & Brodwin, 2014)	This study aimed to determine (a) whether or not faculty were incorporating universal design principles and (b) their attitudes toward students who have disabilities. The instructional methods used most frequently included: following a syllabus, being available to students outside of class, providing feedback, monitoring communication between students, lecturing, and class discussions. The authors also noted that the majority of faculty were not familiar with UDL, although it appeared most faculty used a variety of instructional methods. In a previous study by Black et al. (2013), faculty also indicated a low rating for providing choice in assessment methods, while students rated this choice high in usefulness (Black et al., 2014).

Needs of Students with Disabilities in Postsecondary Education

The number of SWDs attending four-year institutions has steadily increased over the course of two decades (Gregg, 2007; Higher Education Statistics Agency, 2003; Orr, 2009). According to the U.S. Government Accounting Office (2009), SWDs comprise over 11% of the total student population in the postsecondary setting. This growth is significant, as earlier studies indicated SWDs comprised only three percent of the population of college students (Scott et al., 2000). A high withdrawal and dropout rate has also been noted for this population, with many SWDs withdrawing within their first year. Current literature supports this trend; indicating postsecondary faculty and support staff are increasingly likely to work with SWDs (Okolo & Diedrich, 2014). Given the increased rate of enrollment of SWDs in postsecondary settings, the following key areas

pertaining to the needs of SWDs will be discussed: (a) commonly reported disabilities, (b) accommodation issues in the inclusive postsecondary classroom, (c) technology integration issues in the postsecondary classroom, and (d) faculty awareness of the needs of SWDs in the postsecondary classroom.

Commonly reported disabilities. The largest population of SWDs in the postsecondary setting are those with learning disabilities (Orr, 2009). These students may face significant challenges and barriers in the traditional classroom, and are often subject to anxiety and low confidence (Demuth & Smith, 1987; Downey & Snyder, 2001; Javorsky et. al, 1992). In a study by Orr (2009), only 25% of students with documented learning disabilities indicated they intend to complete their degree when asked about their expectations for graduation. This number is particularly concerning as students who demonstrate low confidence may be less likely to remain motivated and persist in challenging courses. In the language classroom in particular, SWDs may suffer embarrassment, stress, and anxiety due to complications with speech articulation and auditory processing, among other barriers to language acquisition (Scott et al., 2010). These students are likely to report barriers such as anxiety about being compared to the performance of peers and unrealistic expectations for achieving fluency. Likewise, activities common to language learning environments, such as spontaneous listening and speaking activities, reading aloud from a textbook, and group activities may present issues for some students with ADHD and dyslexia (Scott et al., 2010). However, while issues pertaining to anxiety and persistence are frequently evidenced by SWDs, little may be known about strategies for accommodating diverse learners within specific subject areas. Likewise, these accommodations, such as reduced class size and implementation of

multimodal instruction, may put a strain on academic departments and their resources (Skinner & Smith, 2011).

The National Center on Educational Statistics (NCES) published a study in 2011, in which disability was defined as "a physical or mental condition that causes functional limitations that substantially limit one or more major life activities including mobility, communication (seeing, hearing, speaking), and learning" (p.12). This survey, collected through the Postsecondary Education Quick Information System (PEQIS), was conducted during the 2009-2010 academic year from approximately 1,600 Title IV eligible postsecondary institutions with a response rate of 89% (Raue & Lewis, 2011). Each of the findings from the survey was based on self-reported data from the institutions. The data collected included counts of SWDs and the services and accommodations provided for SWDs. The survey suggests:

- almost all institutions (99%) reported enrolling students with disabilities;
- a large percentage of these institutions reported enrolling students with the following disabilities: specific learning disabilities (86%), Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) (79%), mobility limitations (76%), and mental illness/psychological/psychiatric conditions (76%);
- approximately one-third of the reported types of disabilities were specific learning disabilities (21%), with the remaining disability types reported as follows: 18% of SWDs had ADD/ADHD, 15% of SWDs had mental illness/ psychological/ psychiatric disabilities, and 11% of SWDs had health impairments;

- and public two-year institutions reported a much higher acceptance rate of students with cognitive or intellectual disabilities (71%) than public four-year institutions (49%) (Raue & Lewis, 2011).

Accommodation needs in the postsecondary classroom. According to the same study conducted by the NCES (Raue & Lewis, 2011), the most common accommodations and support provided by two-year and four-year institutions included additional exam time (93%), classroom note-takers (77%), faculty-provided written notes (72%), assistance with learning strategies and study skills (72%), alternative formats for exams (71%), and adaptive technology and equipment (70%). Likewise, a majority of the institutions (92%) reported students are required to verify their disabilities in order to receive accommodations and support. Such verifications may include a previous IEP or 504 plan from a secondary school, or a comprehensive vocational rehabilitation agency evaluation. A majority of institutions also reported providing one-on-one support, when requested, to assist faculty and staff with meeting the needs of SWDs (Raue & Lewis, 2011).

While institutions often provide support services to SWDs, success of the accommodation process is largely dependent on faculty participation. However, in the postsecondary setting, SWDs are not required to self-disclose or document a disability. Likewise, SWDs with documented disabilities may not always request accommodations due to self-perceptions of their disability (Scott et al., 2010). In a study by Scott et al. (2010), SWDs demonstrated varying comfort levels of self-advocacy in the classroom, with faculty openness to accommodation as a contributing factor. Findings also indicated students who were not asked to disclose learning needs at the beginning of a course were

less likely to perceive the instructor as creating a positive learning environment (Scott et al., 2010). Despite awareness of this issue and the need for inclusive education, the needs of SWDs may not always be addressed in inclusive environments (Spooner et al., 2007). Postsecondary institutions are also responding to this need by considering policy change, such as course waivers, and accommodating students in the classroom with methods such as extended timing (Scott et al., 2012). While some institutions may provide waivers to SWDs, the acceptance rate of such waivers is often limited to exceptional cases. Previous initiatives to bypass the accommodation process have also resulted the creation of specialized courses for SWDs (Scott, 2000). However, such courses may not be necessary, as a number of studies have indicated SWDs can successfully complete such courses when accommodations are provided (Demuth & Smith, 1987; Downey & Snyder, 2001). Despite established structure for responding to the needs of SWDs, multiple studies have shown the accommodation process may not be as effective as more proactive approaches to designing accessible instruction. For this reason, faculty may explore the application of technology as a means of differentiating instruction and more proactively meeting the needs of SWDs.

Technology integration needs in the inclusive classroom. As students vary in their strengths, digital media provides a format that can be customized to the learner (Rose, 2000). As a result of increased enrollment of SWDs, faculty members are beginning to use inclusive methodologies in order to meet the needs of their students and adopt new instructional methods and forms of assessments (Langley-Turnbaugh et al., 2013; Orr, 2009). However, despite both legislation and a wealth of literature that support and mandate the accommodation of all learners through technology, innovative resources

and multimedia content are often reduced to supplementary materials with text as the primary mode of delivery (Berberi et al., 2008). A number of studies promote the need for faculty to remain current in their knowledge of instructional technologies, and the capabilities of such technologies to assist faculty in implementing UDL principles (Higbee, 2008; Levy, 2009; Wilson & Wright, 2011). Results from related studies suggest faculty should adopt a technology-supported inclusive approach to meet the needs of all learners (Pellerin, 2013). In addition, Levy (2009) suggests it is important for faculty to not only be aware of technology, but to demonstrate authentic application of technology to foster learning.

However, studies have shown that increasing technology utilization does not necessarily lead to improved instructional practices; instead, after becoming familiar with a new technology, faculty may use technology more frequently, but often proceed with more traditional methods of instruction (Wilson & Wright, 2011). Other studies suggest there may not be a unified approach among faculty in how they chose to integrate technology (Chatel, 2002; Kennedy et al., 2014). Given legal issues surrounding accessibility, current policies tend to address the needs of students with physical disabilities, rather than more flexible approaches that address the needs of all learners. Such policies may promote technology as a means of delivering informational materials to end users, rather than an approach for addressing learner variability. This mismatch between the architecture of technology and teaching effectiveness may hinder the exploration of such tools to engage all students in the learning process.

Likewise, although the utilization and value of technologies and Web 2.0 tools are often reported in literature, the likelihood of inclusive teaching with technology may be

low (Fuchs & Akbar, 2013). In a study by Fuchs and Akbar (2013), over 70% of instructors reported they were highly proficient in Web 2.0 tools, yet less than 30% indicated they use these tools to deliver instruction and facilitate learning. Also noted in this study was a possible mismatch between the frequency of use and self-reported technology proficiencies; compartmentalization of web tools and lesson planning as separate components of the teaching process; and indicators that technology was viewed as an add-on rather than an integral component of the planning process (Fuchs & Akbar, 2013). While the integration of multimedia tools has been well-supported in literature on accessibility issues and the needs of SWDs, there remain few models for designing instruction and integrating technology with learner variability in mind. Likewise, previous studies have indicated faculty demonstrate mixed perceptions about the support they receive for technology integration and may score low on their knowledge of specific uses of assistive technology (Okolo & Diedrich, 2014). As a result, such faculty may demonstrate an interest in more PD about assistive technology, with perceived barriers to use being a lack of PD and a lack of access to technology and funding (Okolo & Diedrich, 2014).

Faculty awareness of the needs of SWDs. Although a significant number of faculty members may work with SWDs and are aware of the need for accommodation, there remains a gap between this awareness and how they choose to integrate inclusive strategies. In addition, results from a number of studies reveal a disparity between faculty attitudes toward inclusive instruction and whether they authentically integrate inclusive practices in their teaching (Gawronski, 2014). Other studies have indicated instructors may infrequently acknowledge individual differences, specifically in cases where learner

variability is not explicitly discussed during training and PD opportunities (Moreno, 2013). As noted by Pellerin (2009), there does not appear to be a clear model for training faculty on inclusive teaching methodologies. Each of these challenges warrants investigations into frameworks for inclusive instruction, such as UDL, that meet the needs of a broader audience of learners.

Faculty who are familiar with UDL and principles for inclusive teaching may demonstrate limited use of technology. However, it should be noted, while technology is not a necessary component of UDL implementation, it does increase opportunities to address multimodal instruction and employ multiple media. Previous studies on awareness of UDL along the Levels of Use spectrum indicate faculty may remain at a stage of concern that is instructor-centered and focused on the personal implications of UDL (LaRocco, 2013). In the same study, faculty also self-reported as nonusers of UDL principles, with the majority reporting a level of use at orientation. Results of such studies suggest faculty are interested in learning about UDL, and, in order to maximize the implementation of UDL principles, faculty should be engaged in PD that challenges these perceptions (LaRocco, 2013).

UDL as a framework for meeting the needs of SWDs. Learner variability in the postsecondary classroom requires a flexible approach to course planning and design, including the selection and integration of technology. "When it comes to learning, variability is the rule not the exception" (CAST, 2015). However, research has shown while faculty may report applying more than one instructional method in their regular teaching, there remains a need for growth in how they incorporate multimodal instruction as a means of differentiation (Higbee, 2008). For this reason, institutions are beginning to

explore the implementation of UDL as a framework for designing instruction that provides an equal learning experience for all students, including SWDs:

> Universal Design for Learning (UDL) is a set of principles for curriculum development that give all individuals equal opportunities to learn. UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone—not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs. The UDL principles are based on the three-network model of learning that take into account the variability of all learners—including learners who were formerly relegated to 'the margins' of our educational systems but now are recognized as part of the predictable spectrum of variation. These principles guide design of learning environments with a deep understanding and appreciation for individual variability (CAST, 2015).

While the UDL Guidelines (2012) have been well researched and are founded on extensive research in special education and the cognitive sciences, relatively few studies have explicitly addressed the implications of UDL in the postsecondary setting and faculty development needs pertaining to UDL. To better understand the current state of UDL in the postsecondary setting, and how UDL is currently being applied to meet the needs of all learners, the following two key areas will be discussed: (a) UDL and faculty development initiatives, and (b) UDL and institutional initiatives.

UDL and faculty development initiatives. The application of UDL principles may have a positive influence on instructional practices in postsecondary settings (Orr, 2009). As proposed by Meyer and Rose (2005), UDL may provide a framework for addressing learner variability and identifying best practices for designing digital tools for inclusion, and a framework for integrating multimedia content and digital text as a way to provide flexibility in curriculum delivery and differentiation (Meyer & Rose, 2005). A number of studies have been conducted to explore the perceptions of faculty on UDL (Izzo, 2008; Myers, 2008; Skinner, 2007). Related studies indicate faculty members have,

over time, become increasingly familiar with the framework; this has paralleled an increase in the publication of PD materials on UDL (McGuire, 2011). However, while some faculty may be aware of the UDL guidelines, they may not demonstrate this awareness in the classroom (Gawronski, 2014). Likewise, the expressed needs of faculty regarding UDL have been inconsistent in the literature. In a study by Spooner et al. (2007), 87% of participants indicated were unfamiliar with UDL, despite their level of experience with lesson planning and teaching (Spooner et al., 2007).

A number of studies have been conducted with the goal of increasing awareness. In a study on Faculty and Administrator Modules in Higher Education (FAME), which included a series of web-based PD modules, participating faculty selected UDL as a top area of needed PD (Higbee, 2008). An additional initiative, Project LINC (Learning in Inclusive Classrooms), was launched at another institution to introduce faculty to: (a) inclusive course design; (b) considerations for student background, anxieties, and motivations; and (c) start-up activities for the inclusive classroom. This event was followed by monthly workshops addressing specific areas pertinent to accessible course design such as group work, addressing anxiety, assessing learning, and correcting errors. As a result of their participation in Project LINC, faculty indicated they were more aware of learner variability and their ability to accommodate diverse learners (Scott & Edwards, 2012).

UDL and institutional initiatives. According to CAST (2015), there are currently 22 institutions that maintain "active, systematic approaches for implementing UDL." These initiatives led to the development of support resources such as: (a) an institution-wide task force, (b) instructional videos, (c) faculty development resources,

(d) student resources and support, (e) course design best practices, (f) professional learning institutes and annual events, (g) extracurricular implementation, (h) on demand training and workshops, and (i) professional learning communities. Of these 22 institutions, approximately 25% are strategically implementing UDL in course design, while a majority of the institutions (68%) are implementing faculty support and PD on UDL through online resources, training, workshops, professional communities, and other PD initiatives. In addition, approximately 25% of these institutions offer for-credit programs or certificates that explicitly address UDL and inclusive teaching.

Benefits and Barriers to Faculty Development on UDL

Current literature indicates there are many benefits to implementing UDL as a means of differentiation and technology integration in the postsecondary setting. Such studies have highlighted the impact of UDL on faculty development programs about inclusive teaching and technology integration, as well as benefits to learners. Described below are the benefits and barriers to faculty development initiatives and support structure for UDL implementation.

Benefits. As noted in previous studies, both faculty and students may benefit from UDL as a framework for inclusive teaching. UDL provides a model in which SWDs "are seen as part of a continuum of learners with various strengths and weaknesses" (Orr, 2009, para.12), and offers a helpful framework for engaging all learners, regardless of disability (Chita-Tegmark et al., 2012). Likewise, when specialized teaching strategies and accommodations are provided in courses specifically to accommodate SWDs, as well as all learners, exception from these courses may not be needed (Skinner & Smith, 2011). Previous studies have highlighted multiple benefits to explicitly addressing UDL in

faculty development, including an increased awareness of learner variability and the needs of SWDs, changes to course design and implementation, improved technology integration strategies, and improved academic outcomes.

Increased awareness of learner variability and the needs of SWDs. A number of studies indicate PD centered on inclusive teaching and UDL may increase faculty awareness of learner variability and the needs of SWDs (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012). In a study conducted by Scott et al. (2012), faculty indicated they were more aware of learner variability and their ability to accommodate SWDs after participating in Project LINC, a program designed to address Learning in Inclusive Classrooms (Scott & Edwards, 2012). Other studies have indicated explicitly teaching about learner variability may increase the likelihood of inclusive teaching practices. In a study by Moreno (2013) on a teaching preparedness course, when curriculum materials explicitly addressed learner variability as a separate unit, participants demonstrated a greater awareness of the importance of individual differences. In a similar study on the results of faculty development on UDL, one participant indicated, "I had no clue about universal design and really very little idea about the range of challenges facing SWDs — or even the range of disabilities. I suspect that many colleagues have a similar lack of appreciation for the challenges involved in adequately providing material for SWDs" (Langley-Turnbaugh et al., 2013).

Changes to course design and implementation. "The [UDL] framework is a tool that gains strength by the way it is used. Just like a global positioning tool or GPS, the UDL framework can show what the landscape of good learning looks like" (Chita-Tegmark et al., 2012). Multiple studies substantiate the importance of faculty awareness

on the planning and design process; as faculty become more aware of strategies for implementing UDL, they may be more likely to design accessible instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007). Studies have also shown PD focused on UDL is likely to result in increased awareness, and implementation of, inclusive course design strategies (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco & Wilken, 2013; Spooner et al., 2007;). In 2007, Spooner et al. conducted a study in which faculty were provided an introduction to the three principles of UDL and provided examples of how to include SWDs in the general curriculum. After the lecture, participants were provided a case study and were asked to create a lesson plan based on UDL principles. A three-factor ANOVA indicated participants improved lesson plan design after the intervention (Spooner et al. 2007). In a related study, after exploring UDL principles and implementing UDL strategies, all participants indicated they made adjustments in the design of their courses, while many indicated they now deliver information in a variety of formats and incorporate interactive media in their regular instruction (Langley-Turnbaugh et al., 2013).

In a study by Higbee (2008), in which faculty and administrators participated in a series of online modules on UDL, 92% of participants indicated they were more comfortable with accommodating SWDs, while 98% of participants acknowledged the value of multimodal and on-demand PD (Higbee, 2008). In another study on faculty development by Langley-Turnbaugh et al. (2013), participants discussed the role of technology in universally-designed instruction and participated in a number of seminars facilitated by disability support staff and accessibility experts. These seminars resulted in the development of an online module for implementing UDL, a collection of exemplary

lessons, and a rubric for evaluating syllabi and courses (Langley-Turnbaugh et al., 2013). As a result of their participation and use of these resources, all participants indicated they made adjustments in the design of their courses, 64% indicated they began delivering information in a variety of formats, and 43% indicated they incorporated interactive media in their regular instruction (Langley-Turnbaugh, 2013). By participating in such programs, faculty may also be more likely to create an environment that: (a) establishes respect and trust, (b) offers students multiple ways to access course content, and (c) provides students multiple means of demonstrating knowledge (Higbee, 2008). Likewise, faculty development centered on UDL and accessible course design may result in the creation of new, actionable support programs for SWDs within individual academic departments (Scott et al., 2000).

Improved technology integration strategies. UDL and PD opportunities centered on inclusive teaching may offer a helpful framework for technology integration. As noted by Meyer and Rose (2005): "UDL can help us move past the early-stage, old-use applications of new learning technologies, and change the outdated, print centric assumptions underlying current educational practice" (p. 9). This further supports the ongoing need for faculty to remain current in their knowledge of applications and tools that address the needs of all learners, including SWDs. Current literature also indicates inclusive environments can be fostered through the integration of technology (Starcic & Bagon, 2014). Likewise, previous studies indicate technology competency alone has little to no effect on the instructional process; education can only be reformed through the way in which technology is used (Koehler & Mishra, 2005). Several prominent researchers have also emphasized the importance of building learning environments based on a

constructivist worldview (Cox, Fields, & Rakes, 2006). Technology integration may also have an impact on the implementation of constructivist teaching practices (Reeves, 1998). Such studies suggest UDL may offer a helpful model that is constructivist in nature, making it a viable framework for the selection and integration of technology. In addition, studies on multimedia-rich learning environments have indicated more modalities used during instruction may increase the likelihood of mastery (Skinner, 2011). Multimedia and digital content provide flexibility in curriculum delivery and opportunities to differentiate instructional practices (Meyer & Rose, 2005). The UDL guidelines may provide a framework that is more constructive, provide flexible approaches to integrating technology, and encourage the use of more modalities in the traditional classroom.

Improved academic outcomes. Several studies have highlighted the impact of universally-designed instruction on learner success (McGuire, 2011; Scott & Edwards, 2012; Scott et al., 2010; Yuval et al., 2004). In a study by Scott et al. (2010) on the impact of UDL and accessible course design (2010), SWDs acknowledged the importance of clear expectations, as well as flexibility and approachability of the course instructor. In a related study by Yuval et al. (2004), students perceived UDL principles as having a positive effect on their academic progress. In addition to having an impact on learner perception, a number of studies have also suggested approaches to implementing UDL may have a direct impact on academic success. In related studies on the impact of accessible and universally-designed instruction, grade distributions and withdrawal rates among students with and without disabilities were narrowed (McGuire, 2011; Scott & Edwards, 2011).

Barriers. Kennedy et al. (2014) argue the UDL framework should be considered with caution for these reasons: (a) it is broad-reaching and designed to address the needs of all subject areas and all learners, (b) there is little empirical data that applying UDL principles impact the academic success of SWDs, and (c) researchers, policy makers, and practitioners may not currently have the means to measure universally-designed instruction (Kennedy et al., 2014). Likewise, previous models and studies have historically been centered on the architectural principles of UD rather than neuropsychological and pedagogical research (McGuire, Scott, & Shaw, 2004). While UDL has received recent attention in postsecondary research, there has been a lack of interdisciplinary focus on UDL by faculty (Rose et al., 2006). For this reason, it may be challenging to promote UDL as a framework for best practice due to a lack of research at the postsecondary level (McGuire, 2011). In addition, a study by the NCES suggests the most commonly reported barriers to implementing Universal Design strategies included limited staff resources for training on accessibility issues (52%) and the cost of purchasing appropriate technology (46%).

Rationale for Faculty Development on UDL and Related Studies

By addressing UDL as professional knowledge, institutions may increase awareness of learner variability among faculty, raise standards for course design and technology integration, and increase the likelihood of success for SWDs. Likewise, implementing the UDL framework as an institutional initiative may provide opportunities to more comprehensively address legal obligations for accessibility, improve models for technology PD, and provide opportunities for institutional collaboration.

Legal obligations for accessibility. Federal requirements mandate all SWDs be accommodated in cases where a student has self-disclosed a disability. The Section 508 Amendment to the Rehabilitation Act of 1978 requires all electronic and information technology to be accessible to learners with disabilities. More specifically, it requires that "individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities." Faculty, therefore, must account for a broader spectrum of learners when designing instruction. In addition, pressure from legislation and the ADA have driven faculty to examine the value of technology and educational media. Such requirements may provide a pathway for examining curricular change that improves learning experiences for all students (Meyer & Rose, 2005).

Models for technology PD. A number of studies have revealed the importance of digital technology in the inclusion and accommodation process (Hopkins, 2004). However, research initiatives in technology PD indicate advancements in technology skills alone are highly unlikely to lead to quality, student-centered technology integration. While accessibility policies mandate the use of assistive technologies to support the inclusion of students with disabilities, this is also built on an assumption that such technologies are a means to an end (Okolo & Diedrich, 2014). This may be paralleled by ineffective faculty development models, in which technology may be promoted as a comprehensive solution, rather than a tool to facilitate learning. As suggested by the Center for Applied Special Technology (CAST, 2011), technology cannot be a single solution to the challenge of meeting the needs of all learners, but must be contextualized

in effective instructional practices. By participating in technology PD contextualized in both technology and pedagogy, faculty may demonstrate a greater awareness of the variety of learning strategies made possible with technology (Harris & Hofer, 2011), and, subsequently, may more successfully employ tools to combat two key issues pertaining to learner variability: individual characteristics or disabilities which interfere with the learner's ability to access content, engage in a course, or demonstrate knowledge; and issues resulting from how the learning environment was designed (Rose et al., 2006). By explicitly addressing the three domains of knowledge pertaining to the UDL framework, technical standards and guidelines, and content-specific strategies, institutions may more effectively address faculty development needs pertaining to accessibility.

Opportunities for institutional collaboration. Participating in UDL initiatives may also foster and encourage collaborative approaches to meeting the needs of all students. Currently, faculty often rely on centralized support services to obtain assistance with accommodating students, as they may feel ill-prepared to work with SWDs (Orr, 2009). A number of studies have been conducted on collaborative frameworks resulting from investigations into inclusive teaching practices and UDL (Scott & Edwards, 2012; Scott et al., 2000; LaRocco et al., 2013). Such studies helped to identify: (a) which accommodation recommendations have become a routine part of the centralized support services on campus; (b) supports that were in place but were not adequately leveraged; and (c) supports that were not feasible to conduct (Scott et al., 2000). Learning communities centered on addressing campus-wide accessibility and accommodation concerns have also emerged from the strategic implementation of faculty development on accessible course design (LaRocco et al., 2013). These results suggest institutional

collaboration may result in more effective PD opportunities for faculty and the development of new support programs (Scott & Edwards, 2012). Likewise, integrating UDL guidelines on an institutional level may serve as a pathway to establishing campus-wide, interdepartmental communities of practice designed to address issues pertaining to learner variability and the needs of SWDs.

Summary

The purpose of Chapter 2 was to provide an overview of literature related to UDL, the emergence of UDL in the postsecondary setting, the needs of students with disabilities in the postsecondary setting, benefits and barriers to faculty development on UDL, and rationale for faculty development on UDL and related studies. This review of literature suggested UDL-focused PD may lead to an increased awareness of learner variability and the needs of SWDs (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012); changes to course design and implementation (Higbee, 2008; LaRocco et al., 2013; Langley-Turnbaugh et al., 2013; Spooner et al., 2007), differentiated instructional practices facilitated by technology (Meyer & Rose, 2005; Skinner, 2011), and improved academic outcomes (McGuire, 2011; Scott & Edwards, 2012; Scott et al., 2010; Yuval et al., 2004). As few studies have explicitly addressed the perceptions of faculty about UDL after participating in UDL-focused PD, this study aims to contribute to and strengthen existing literature by identifying the perceptions of faculty resulting from UDL-focused PD and their ideas for implementing technology-enriched UDL strategies.

Chapter 3: Methodology

The primary goal of this study is to investigate the perceptions of faculty who participated in an online module on technology-enriched UDL strategies. The research questions driving this study were designed to identify faculty perceptions about the needs of students with disabilities (SWDs), the application of technology to meet the needs of SWDs, and technology-enriched UDL strategies. A qualitative case study approach was applied in this study in order to gain a rich understanding of the perceptions, thoughts, and values that may influence practice. This chapter describes the methodology that was applied in the design of the study, and is organized as follows: (a) research design, (b) instrumentation, (c) procedures, (d) data collection, (e) data analysis, (f) limitations, and (g) biases and subjectivities.

Research Design

This descriptive research study utilized a semi-structured interview process to gather qualitative data related to each of the following questions:

1. After participating in an online module on technology-enriched UDL strategies, what are the perceptions of faculty about the needs of SWDs?
2. After participating in an online module on technology-enriched UDL strategies, what are the perceptions about application of technology to meet the needs of SWDs?
3. After participating in an online module on technology-enriched UDL strategies, how do faculty consider applying technology to address the needs of SWDs?

4. After participating in an online module on technology-enriched UDL strategies, what are the overall perceptions of faculty about technology-enriched UDL strategies as a framework for addressing the needs of SWDs?

The collected data provides insight specifically into the perceptions of faculty about the needs of SWDs, the application of technology to meet the needs of SWD, and technology-enriched UDL strategies. Described below is the site of research, participants, research intervention, and instrumentation that was utilized to gather data for the study.

Site of research. The site of research was a four-year institution in the southeastern United States with an enrollment of approximately 21,000 students. Of these students, approximately 16,600 are undergraduate students, and 3,600 are graduate students. The majority of the students are full time (68%) with 32% part-time students. Approximately 930 faculty teach at the site of study, with approximately 40 faculty employed in the foreign language department. This department also offers foreign language curricula to students in a variety of majors who are seeking lower-division undergraduate course credits in order to qualify for graduation. At the time of the study, the institution was in the process of implementing a new accessibility plan. This plan involved plans to launch an accessibility tutorial for all faculty members at the site of study, as well as subsequent support that would be required to assist faculty in implementing accessibility guidelines. The state of the institution at the time of the study indicated the institution was largely focusing on the provisions of accessible instructional and informational materials. Faculty who taught high-enrollment courses were required to attend training for accessibility in the fall, and there has also been anecdotal evidence that faculty have become more aware of the pending accessibility requirements due to

this training. Approximately 4% of students enrolled at this institution have documented disabilities.

Participants. Participants selected for the proposed research were employed in the foreign language department at the site of study. Since fall 2014, approximately 40 faculty and instructors have taught foreign language courses at this site of study. Out of approximately 40 faculty and instructors who have taught in this department over the past year, approximately 25 have taught lower-division undergraduate courses. In spring 2016, approximately 22 full-time faculty, part-time faculty, and instructors were teaching lower-division undergraduate courses. These lower-division language courses also help students in a variety of majors meet general education requirements.

The sample participants in the study were identified through purposive sampling of full-time faculty, adjunct faculty, and instructors who teach lower division undergraduate language courses. These participants served as a sampling of the target audience of language faculty. Language faculty were selected for the target audience as the online module was designed with this audience in mind Most of the participants obtained a graduate or post-graduate degree in the subject matter taught. In an initial needs assessment survey of the target population (n = 25), 100% of participants indicated they teach SWDs, with learning disabilities (80%) and ADHD (68%) as the most commonly reported disabilities.

A purposive sampling procedure was applied in order to identify sample participants for the study and, subsequently, conduct the research with lower-division undergraduate language instructors who completed an online module on technology-enriched UDL strategies. Each participant was selected by identifying instructors who

teach lower division undergraduate foreign language courses and, then, identifying which faculty had completed an online instructional module on technology-enriched UDL strategies. Five participants from this sample of the target audience of lower-division, undergraduate faculty comprised the participants in the study. Specific data related to the number of years teaching, position, and age are not included in the reporting of this study in order to protect the privacy of each of the participants. This assurance of anonymity was particularly important to the study as participants may have discussed issues related to the topic and their profession during the data collection process; assurance was also provided to the participants upon agreeing to the study that identifiable information would not be reported. Each participant self-identified as faculty who teach lower-division undergraduate language courses at the site of study, and provided information upon agreeing to participate in the study related to any previous involvement in PD related to the Universal Design for Learning framework. Of these self-identified participants, only those who had completed a web-based faculty development module on technology-enriched UDL strategies were selected to participate in the study.

UDL-focused PD: online module on technology-enriched UDL strategies. Foreign language requirements present specific challenges for SWDs (Scott & Edwards, 2012). While several models exist for inclusive foreign language curricula, relatively few provide information on how to provide a more diverse learning experience for foreign language students within the standard curriculum. *Technology-Enriched UDL Strategies* is an online UDL-focused PD module for language instructors in the postsecondary setting. The module is an asynchronous, self-paced online course designed to be completed in 1.5 hr and broadly address accessibility issues and awareness of

technology-enriched UDL strategies. In order to meet the needs of faculty who may be likely to teach SWDs, the intended outcome of the intervention was to increase awareness of key concepts and issues pertaining to accessibility in postsecondary education, and identify strategies for applying the UDL framework in the integration of technology and multimodal instruction. Instructional activities were specifically targeted to assist faculty with conceptualizing lessons or activities that are more inclusive of SWDs, and identifying content-specific technology-enriched UDL strategies that can be applied in the design of inclusive instruction. For faculty members who completed the module, instruction was provided on the design of accessible instruction, strategies for accommodating SWDs, the Universal Design for Learning framework, and technology-enriched UDL strategies. Prior to launch of this PD module, field trials indicated this module may effectively address knowledge and awareness of these five key domains.

Interview Protocol

The selected faculty participated in an interview (Appendix A) designed to gather qualitative data pertaining to faculty perceptions related to each of the proposed research questions. An interview protocol was designed to guide each interview from the preparation of interview materials to the interview introduction. Prior to beginning each interview, the following protocol was read to participants. In addition, it was necessary to explicate the term SWD, which was used throughout the line of questioning during the interview.

For the purposes of this interview, the term "students with disabilities" includes the following disability types: specific learning disabilities, which is the most prominent disability type; ADD/ADHD; as well as other less prominent disabilities such as:

difficulty seeing, difficulty hearing, mobility limitations, and other health impairments. Each of the interview questions and prompts (Table 3) were designed to provide descriptive, qualitative data toward addressing each of the research questions.

Table 3

Semi-Structured Interview Questions

Lead Question 1. Describe your overall thinking about the needs of students with disabilities.
Follow-up Questions:

- In your opinion, which of these needs (of students with disabilities) are faculty likely to face in their courses?
- In your opinion, which kinds of needs are students with disabilities likely to disclose?
- In your opinion, in what ways do the needs of students with disabilities parallel the needs of all students?

Lead Question 2. Imagine you have been asked to speak at a faculty meeting in your department about the needs of students with disabilities.
Follow-up Questions:

- How would you describe the needs of students with disabilities to your faculty?
- Which needs do you feel would be the most important to address with your colleagues, and why?
- Which needs do you feel would be the least important to address with your colleagues, and why?

Lead Question 3. In what ways do you feel the needs of students with disabilities influence you and your teaching?
Follow-up Questions:

- In your opinion, which of these needs is the most difficult for you to address and why?
- In your opinion, which of these needs is the easiest for you to address and why?

Lead Question 4. Share 1-2 technology-enriched lesson ideas that you can use in your courses to better address the needs of students with disabilities.
Follow-up Questions:

- What UDL strategies might you apply in each lesson to make it more accessible?
- What kinds of tools and technologies would assist you in applying these strategies?

Table 3 (Continued)

Semi-Structured Interview Questions

Lead Question 5. Describe a current lesson that could be made more accessible to students with disabilities through the application of technology.
Follow-up Questions:

- What would you change about this lesson, and why?
- In what ways would this change positively impact students with disabilities?
- In what ways would this change positively impact all of your students?

Lead Question 6. Describe your overall perception of UDL as a framework for addressing the needs of students with disabilities.
Follow-up Questions:

- Which aspect of the UDL framework do you feel is most useful, and why?
- Which aspect of the UDL framework do you feel is the most challenging to address, and why?

Lead Question 7. In your opinion, what are the benefits to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?

Lead Question 8. In your opinion, what are the barriers to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?

Procedures

Described below are procedures that were involved in conducting the study, including: participant identification and recruitment, and participant interviews. Each of the procedures involved in this study were carefully designed to maximize the data collection process.

Participant identification and recruitment. Prior to recruiting participants, a list of faculty who taught lower-division undergraduate language courses were obtained from the institution's course database at the site of study; data used to determine which faculty met the criteria were obtained from course listings for the spring 2016 semester as well as previous semesters up to a year prior. These listings were created by first identifying the

list of languages taught and then searching for courses with lower-division prefixes. A contact list was generated from a list of individuals who matched the criteria of lower-division undergraduate language instructors. These faculty members were recruited via email (Appendix B) requesting responses for the study, with instructions to respond within one week.

This first phase of participant recruitment also included completion of the Institutional Review Board approved consent form; completion of the consent form indicated participants were willing to participate in the study and understood any risks involved. Once participants responded and indicated interest in participating in the study, a follow-up email was sent to participants to discuss the intent of the study, the plan and the phases of the study, and timeline for participation. This phase of the study was designed to introduce participants to the study and give them an overview of the online module on technology-enriched UDL strategies, and inform participants as to how to enroll in and complete the module. Participants were not selected to partake in the study unless they had completed the module; of six faculty members who consented to the study, five qualified to participate. Completion of the online module served as one of the selection criteria for the study; for this reason, data were not collected from the instructional module. Once participants were identified, an email (Appendix B) was sent to each participant with next steps for participating in the study, along with a selection of dates and times for scheduling interviews post intervention.

Participant interviews. Interviews were scheduled for 1.5-hr windows during the date and time selected by the participants; all interviews were conducted over the course of one week. With a qualitative case study approach in mind, these interviews were

planned to take place in the participants' individual offices in order to allow for discussion in an environment most familiar to them. This also allowed the researcher to note any observations about the participant's work environment and setting.

At the beginning of each interview, an introduction and protocol was read to participants in order to ensure all participants had a similar understanding of the line of questioning during the interview. This protocol clarified two key terms used throughout the interview: "needs of students with disabilities" and "students with disabilities." The needs of SWDs were explicated as instructional needs only; faculty were encouraged to consider the learning needs of the students and to not consider any needs that may fall outside of the instructional setting. The term "students with disabilities" was clarified by providing a selection of the most common disabilities in the postsecondary setting. In order to ensure faculty were not exclusively considering disabilities such as visual and hearing impairments, the interview protocol also emphasized learning disabilities as the most prominent disability type.

After the introduction to the interview, and prior to beginning the recording, faculty were provided an opportunity to ask questions. If they did not have any questions, the researcher proceeded to begin recording and initiate the interview with the questions as indicated in Appendix A. All participant responses were captured on two recording devices; one of the recording devices served as a back up and was not used during the transcription process. The interview questions were strategically designed to capture rich, descriptive data related to each of the research questions. During the interview, the researcher made notes to any modifications to questions over the course of the week; these modifications were minimal and did not impact the meaning of the questions or the

line of questioning. Participants were also provided opportunities to ask questions during the interview or ask for clarification about specific questions. At the conclusion of each interview, participants were thanked for their contribution to the study and provided information about next steps, including how the data will be utilized, when the recordings will be deleted, and opportunities to review the data for member checking purposes. Data were not transcribed or coded until after all interviews were completed.

Data Collection

Before participating in the intervention, participants from the sample group provided consent to participate in the study (Appendix C). Through this form, participants may provide information that may be personally identifiable; however, once participants have been contacted for the study, personally identifiable data were removed and participants were assigned a unique identifier. Any data submitted during the intervention, such as responses to instructional modules, were utilized in the research. Research data were collected post-intervention during a semi-structured interview process. Responses to all interview questions were recorded via audio recording software.

At the conclusion of the intervention, participants were instructed to schedule an interview session with the researcher, which was designed to be completed in approximately one to two hours. During the first phase of data collection, and upon completion of the instructional intervention, participants were asked to respond to a series of questions designed to measure perceptions of the needs of SWDs and the application of technology to address the needs of SWDs. During the second phase of data collection, and upon identifying one or two lesson ideas, participants were asked to respond to a series of questions designed to measure in what ways they consider applying technology

to meet the needs of SWDs and their overall perceptions of technology-enriched UDL strategies. The researcher acknowledged additional data that emerged during this phase of the data collection process, and was prepared to document any unanticipated conversations, observations, or responses from participants.

Described below (Table 4) are items from the semi-structured interview process that were used to collect data during the study and an indication of how these measurements aligned to the proposed questions for the research. Participant responses to these questions were captured via two recording devices and then sent for transcription. Participants were also provided a copy of data from the transcribed interviews for member checking purposes.

Table 4

Research Question - Instrument Alignment

Interview Question	Research Question
Lead Question 1. Describe your overall thinking about the needs of students with disabilities. Follow-up Questions: ● In your opinion, which of these needs (of students with disabilities) is faculty likely to face in their courses? ● In your opinion, which kinds of needs are students with disabilities likely to disclose? ● In your opinion, in what ways do the needs of students with disabilities parallel the needs of all students?	RQ1. After participating in an online module on technology-enriched UDL strategies, what are the perceptions of faculty on the needs of students with disabilities?
Lead Question 2. Imagine you have been asked to speak at a faculty meeting in your department about the needs of students with disabilities. Follow-up Questions: ● How would you describe the needs of students with disabilities to your faculty? ● Which needs do you feel would be the most important to address with your colleagues, and why? ● Which needs do you feel would be the least important to address with your colleagues, and why?	

Table 4 (Continued)

Research Question - Instrument Alignment

Interview Question	Research Question
Lead Question 3. In what ways do you feel the needs of students with disabilities influence you and your teaching? Follow-up Question: ● In your opinion, which of these needs is the most difficult for you to address and why? ● In your opinion, which of these needs is the easiest for you to address and why?	
Lead Question 1. What kinds of tools and technologies do you feel are needed in order to meet the needs of students with disabilities? Follow-up Question: ● In your opinion, in what ways could the application of these technologies positively impact students with disabilities? ● How do you know this?	RQ 2. After participating in an online module on technology-enriched UDL strategies, what are the perceptions of faculty on the application of technology to address the needs of students with disabilities?
Lead Question 2. Do you feel technology enables you to customize the learning experience for students with disabilities? Follow-up Question: ● Why or why not? ● What experiences have led you to this conclusion?	
Lead Question 3. Do you feel technology makes it easier to address the needs of students with disabilites? Follow-up Questions: ● Why or why not? ● What experiences have led you to this conclusion?	
Lead Question 4. Share 1-2 technology-enriched lesson ideas that you can use in your courses to better address the needs of students with disabilities. Follow-up Questions: ● What UDL strategies might you apply in each lesson to make it more accessible? ● What kinds of tools and technologies would assist you in applying these strategies?	RQ3. After participating in an online module on technology-enriched UDL strategies, how do faculty consider applying technology to address the needs of students with disabilities?

Table 4 (Continued)

Research Question - Instrument Alignment

Interview Question	Research Question
Lead Question 5. Describe a current lesson that could be made more accessible to students with disabilities through the application of technology. Follow-up Questions: ● What would you change about this lesson, and why? ● In what ways would this change positively impact SWDs? ● In what ways would this change positively impact all of your students?	
Lead Question 6. Describe your overall perception of UDL as a framework for addressing the needs of students with disabilities. Follow-up Questions: ● Which aspect of the UDL framework do you feel is most useful, and why? ● Which aspect of the UDL framework do you feel is the most challenging to address, and why?	RQ 4. After participating in an online module on technology-enriched UDL strategies, what are the overall perceptions of faculty on technology-enriched UDL strategies as a framework for addressing the needs of students with disabilities?
Lead Question 7. In your opinion, what are the benefits to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?	
Lead Question 8. In your opinion, what are the barriers to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?	

Data Analysis

The goal of the proposed study was to gather rich, descriptive data pertaining to perceptions of faculty about the needs of SWDs, perceptions of faculty about the application of technology to meet the needs of SWDs, ways faculty consider applying technology to meet the needs of SWDs, and the overall perceptions of faculty about technology-enriched UDL strategies. In order to effectively analyze the data, each of the

interviews was transcribed verbatim. Once interviews were transcribed, transcriptions were reviewed against the recordings and all recordings were deleted. Each interview transcription was assigned an anonymous participant name as to not identify faculty who consented to the study.

Both a narrative analysis and thematic analysis of data were applied in the review of data. Narratives typically consist of responses to open-ended questions, and are concerned with telling a story, while thematic analyses are generally centered on the analysis of coded data for themes and patterns (Glesne, 2011). Both of these analytical approaches were considered as a method of revealing emerging themes related to the research questions, and rich, descriptive stories that developed during the interview process. Likewise, conducting a thematic analysis may help to reveal relationships among the narratives (Glesne, 2011). In order to conduct a thematic analysis, data were coded and organized according to research questions and emerging themes, including any unanticipated ideas or stories captured during the interview.

After sorting data according to themes, a descriptive analysis was conducted in order to identify the range of responses to each of the interview questions and any recurrent ideas. The resulting sorted and coded data were then analyzed and described according to the proposed research questions. A thematic analysis was conducted by looking for major themes among responses to the interview questions, any additional categories or themes that emerged, and the range of responses to each of the questions that were addressed in the interview. Data were sorted and coded via a spreadsheet by unit of analysis, interview question, and theme or category. This process was repeated, until it became clear where themes emerged, how such themes aligned to the research

questions, and any emergent themes that add value to reporting but may not align to the research questions. Among the data, a narrative analysis was also conducted with specific attention to any emerging stories or extended responses from the participants, noting any events, feelings, and reactions expressed by participants during the interview.

Limitations

As there may be lack of peer-reviewed studies and literature on UDL in the postsecondary setting, future studies may be required in order to strengthen results. Likewise, previous models and studies have historically centered on the architectural principles of Universal Design (UD), rather than pedagogical research (McGuire et al., 2004). Such studies on the architecture of technology have promoted both UD and Universal Design for Instruction (UDI) as models for designing accessible instructional materials. As UDL is a broad-reaching instructional framework, rather than a content delivery model, there currently may not be means to measure its implementation (Kennedy et al., 2014). For this reason, the study focuses on the identification of faculty perceptions about the framework, including their ideas for integrating technology-enriched UDL strategies. In order to obtain rich, qualitative data, the study was conducted with a small sampling of faculty at one site of study accessible to the researcher. However, it may be challenging to generalize results from a singular study on faculty perceptions to the target population of postsecondary faculty. For this reason, subsequent studies should be conducted with the target population across a variety of academic disciplines and institutions.

In addition, this study was conducted with a sampling of adjunct faculty and full-time faculty. In order to effectively research the perceptions of faculty who typically

influence the design of courses and curricula, it is recommended future studies be replicated with instructor-developers and full-time faculty. Likewise, as the study participants teach primarily face-to-face courses, it is recommended additional studies focus solely on faculty who teach in online environments.

Delimitations

The delimitations in this study are based on the need to gain a better understanding of the perceptions of faculty who may teach SWDs and the impact of UDL-focused PD. In order to control for confounding variables such as a lack of experience working with SWDs, the study was limited to instructors who teach undergraduate lower-division courses, including full-time and part-time faculty. A sampling of language faculty was selected for the study as they had additionally completed an online module on technology-enriched UDL strategies. Individuals in other academic areas at the site of study did not participate nor have access to this module; likewise this module provided examples of content-specific strategies. Previous research has shown that PD specific to content area is likely to be more effective. This study was not designed to measure the transfer of knowledge from the intervention to the classroom. For this reason, further studies should be conducted in order to correlate faculty perceptions about the UDL framework and authentic application of UDL strategies.

Likewise, the line of questioning for the interviews addressed "students with disabilities" rather than more ill-defined groups such as "diverse learners" in order to help participants draw on relevant experiences with a more specific, identified group of learners. For this particular study, a specific subset of disabilities was not addressed in the line of questioning in order to maximize faculty perceptions about the variety of needs

that can and should be addressed by UDL, rather than a specific disability. In order to maximize the term "students with disabilities," participants were provided a definition of the most common disabilities exhibited in the postsecondary setting prior to each interview. These disabilities, as identified by the National Center on Educational Statistics (NCES, 2011) suggested: (a) 81% of postsecondary institutions enrolled students with ADD; (b) 79% of postsecondary institutions enrolled students with ADHD; and (c) 76% of postsecondary institutions enrolled students with mobility limitations and mental illness/psychological/psychiatric conditions. In the same study it was reported that, of all disability types, the following two disability types were most common; 21% of SWDs enrolled in postsecondary institutions had specific learning disabilities, and 18% of SWDS had ADD/ADHD. As it appears postsecondary institutions commonly enroll students with disabilities, and specific learning disabilities and ADD/ADHD may be the most common disability types, these disability types were explicated within a definition of "students with disabilities" prior to conducting the interview. Focusing on a specific disability type, such as learning disabilities, may have provided deeper insight into perceptions around specific disabilities; however, this was not explicated in the research questions in order to ensure faculty were thinking more holistically about the variability of learners and the need to design instruction around a variety of needs, rather than a very specific subset of students.

Lastly, a case study approach with five interviews was selected in order to gain rich, descriptive data related to the perceptions of faculty. Likewise, while faculty perceptions about UDL may be highly contextual, a case study approach may reveal both similarities and differences among such perceptions. Due to the time commitment of

faculty as well as the need to sample faculty from a smaller population, it was deemed necessary to enable both adjunct and full-time faculty to participate in the study. Likewise, all faculty members selected for the study were foreign language instructors and may have had unique experiences teaching SWDs from faculty who teach in other academic areas; for this reason, future studies, in order to generalize to a broader target population, should be conducted with across a variety of academic areas. In addition, this study may be duplicated with a focus on only full-time faculty or instructor-developers in order to assess the perceptions of faculty who are able to modify and design curriculum.

Many of the previous studies on UDL have been limited by sample size or limited to one site of study (i.e., Chatel, 2002; Gawronski et al., 2014; Langley-Turnbaugh, et al., 2013; LaRocco et al., 2013; Moreno, 2013; Scott et al., 2012; Spooner et al., 2007). Likewise, additional limitations in related research include a lack of random sampling (Higbee, 2008), reliance on self-reported data (Gawronski et al., 2014; Higbee, 2008;), or have revealed results inconsistent with previous studies (Gawronski et al., 2014). Other studies have primarily focused on the specific needs of graduate assistants and novice instructors (Allen & Neguerla-Azarola, 2010; Fuchs &Akbar, 2013; Moreno, 2013;) or educators in the K-12 setting (Meyer & Rose, 2005; Spooner et al., 2007; Okolo & Diedrick, 2014; Pellerin et al., 2013). In addition, UDL is a broad-reaching framework designed to address the needs of all subject areas and learners, and practitioners currently may not have the means to measure universally-designed instruction (Kennedy et al., 2014). Additionally, previous models and studies may be more centered on the architectural principles of universal design rather than pedagogical research (McGuire et

al., 2004). Each of these factors may challenge the promotion of UDL in research as a framework for best practice in the postsecondary setting.

In order to maintain anonymity of participants, demographical data and other information such as years experience teaching, professional history, and job title were not reported in the study. For this reason, each case is primarily identified and described as faculty who teach lower-division undergraduate language courses and completed an online module on technology-enriched UDL strategies. Likewise, the design of the study and sample size does not provide opportunities to form generalizations to the target population. In addition, any data regarding the effectiveness of prior PD on UDL is self-reported and based on faculty perceptions. For this reason, the study does not measure the effectiveness of the online module in which faculty participated, but, rather, the possibility that the online module may have had an impact on their perceptions.

Biases and Subjectivities

The qualitative methodologies exhibited in this study may be vulnerable to biases and subjectivities, based on several factors related to the researcher's professional experiences: the researcher previously taught foreign languages and courses designed specifically for SWDs for a number of years; the researcher is deeply engaged in the development of accessibility policy and course design guidelines for faculty at the site of study; and the researcher serves in an instructional design support role at the site of study. For this reason, the researcher may maintain a pragmatic paradigm with an interest in producing research that is useful to the target audience. Several procedures, as proposed by Cresswell (1998), were applied to avoid the potential for bias in the research design

including member checking to ensure transcripts accurately portray responses during the semi-structured interview process.

Summary

The purpose of Chapter 3 was to provide an overview of the methodology behind the study, including the research design, instrumentation, procedures, data collection and analysis, and limitations. A semi-structured interview process was used to identify perceptions of five lower-division undergraduate foreign language faculty members at the site of study who had completed an online module on technology-enriched UDL strategies. Also discussed in this chapter were the means by which participants were identified and recruited, as well as the procedures by which data were collected and analyzed. The limitations of the research and delimitations were discussed as well. Also briefly discussed were potential biases and subjectivities that my have affected the study.

Chapter 4: Findings

The purpose of this study was to examine the perceptions of faculty who had participated in UDL-focused PD, an online module on technology-enriched UDL strategies. The following research questions informed the study:

1. After participating in an online module on technology-enriched UDL strategies, what are the perceptions of faculty about the needs of students with disabilities (SWDs)?
2. After participating in an online module on technology-enriched UDL strategies, what are the perceptions of faculty about the application of technology to address the needs of SWDs?
3. After participating in an online module on technology-enriched UDL strategies, how do faculty consider applying technology to meet the needs of SWDs?
4. After participating in an online module on technology-enriched UDL strategies, what are the overall perceptions of faculty about technology-enriched UDL strategies to meet the needs of SWDs?

The selection criteria for participation in the study included faculty who taught lower-division undergraduate language courses and completed an online development module on technology-enriched UDL strategies. During a semi-structured interview process, participants were prompted to discuss their perceptions about the needs of SWDs, the application of technology to meet the needs of SWDs, ideas for integrating technology to meet the needs of SWDs, and their overall perceptions of technology-enriched UDL strategies. The line of questioning during the interview was designed to

elicit responses relevant to the research questions and identify emerging themes among the perceptions and ideas expressed by the participants.

The purpose of this chapter is to present findings related to each of the major themes and sub-themes that emerged during the interviews by reporting on the perceptions and ideas of the participants. This chapter is divided into sections according to the three major themes that emerged during the study: (a) awareness of learner variability and challenges faced by SWDs, (b) benefits and barriers to applying technology-enriched UDL strategies, and (c) the impact of UDL-focused PD on faculty perceptions and practice. The purpose of each section is to identify and provide an overview of participant responses and narratives related to the major themes and subthemes that emerged during the study. Central to these findings are excerpts from the interview process, which provide rich, transparent details to support the case study findings.

It should be noted that faculty understanding and perceptions of UDL are highly contextual and may be impacted by a number of variables including: experience teaching SWDs, experience with the accommodation process, subject matter taught, and prior knowledge of the needs of SWDs. For this reason, responses within each theme vary and are based on the individual professional experiences of each participant. Therefore, it is not the intent of the study to discuss the similarities and differences between each participant, but, rather, to provide an overview of the case with supporting evidence for each emerging theme. Likewise, in several instances during the study, some participants provided less detailed responses than others, provided extraneous responses unrelated to the themes, or appeared to not respond directly to the line of inquiry. These differences,

where relevant, may be indicated by the omission of the participant's response within that particular theme.

Although each of the major themes is addressed distinctly in the findings, it should be noted there is considerable overlap between themes and sub-themes as well. For cases in which there is overlap among themes, specific examples from the interview were addressed within the theme to which the data is most closely and logically aligned. Likewise, extraneous data and perceptions were also documented in the research, but are not reported in the findings in order to maintain an explicit focus on the major themes, sub-themes, and related research questions. By addressing these emergent themes, a better understanding may be gained about: (a) the pre-existing and current perceptions and ideas of the participants and (b) how these perceptions and ideas may have been impacted by the online module on technology-enriched UDL strategies.

From Accommodation to Inclusivity: An Emerging Dialogue

The interview process was specifically designed to capture faculty perceptions and ideas related to the needs of SWDs, the application of technology to meet the needs of SWDs, and the application of technology-enriched UDL strategies. These questions were also designed to measure the impact of an online module on technology-enriched UDL strategies, as self-reported by the participants. While five unique narratives emerged from interviews, there appeared to be a pattern in the way faculty explicated and formed their ideas and perceptions during the interview process.

When asked to describe the needs of SWDs early in the interview, participants appeared to be strongly focused on the accommodation process as a means of meeting such needs. This finding suggests, when asked explicitly about the needs of SWDs,

participants were likely to reference the accommodation process rather than more proactive means of addressing such needs. In the initial stages of the interview process, several participants also expressed a lack of knowledge about the needs of learners and SWDs, and implied they would not be able to meet such needs without explicit directions or support from disabilities services. However, as the line of inquiry prompted discussions about the application of technology and technology-enriched UDL strategies, faculty perceptions and ideas centered on more inclusive, learner-centered approaches to meeting the needs of SWDs and all learners.

This pattern of emergence suggests the line of questioning during the interview may have also been influential in the formation of emerging ideas and perceptions surrounding the topics covered in the module. With the online module as a baseline for conversation, faculty revealed emerging perceptions about each of the topics, with occasional references to changes in perceptions and ideas stemming from the online module. Although the study was initially intended to measure the impact of the online module on technology-enriched UDL strategies, participant responses during the interview suggest the line of inquiry, in combination with ideas generated from the online module, may have also prompted faculty to reconsider the way they design instruction. This emergence has also been evidenced in related studies which suggest explicitly addressing UDL may increase the likelihood of inclusive teaching practices. However, these studies do not suggest there is a singular approach as to how faculty acquire such knowledge or attitudes about inclusive instruction. The online module on technology-enriched UDL strategies discussed in this research is a unique, but not exclusive, example

of a UDL-focused PD opportunity that may facilitate change in the way faculty perceive and implement UDL, and subsequently, influence practice.

Awareness of Learner Variability and Challenges Faced by Students with Disabilities

This section discusses findings regarding participants' awareness of learner variability and the perceived challenges faced by SWDs. Within this major theme, findings also revealed perceptions and ideas including: (a) SWDs need to be accommodated; (b) SWDs may not disclose learning needs to faculty; (c) the needs of SWDs parallel the needs of all learners; and (d) a variety of tools are needed to meet the needs of all learners. Described below is an overview of the major theme and sub-themes, along with supporting examples of participant responses collected during the study.

SWDs need to be accommodated. Findings within this theme suggest participants perceived SWDs need to be accommodated, but faculty may not be able to address this need due to non-disclosure. Four participants perceived SWDs are likely to disclose the need for accommodations to disability services, and indicated such needs may not always be disclosed to faculty.

> Robert: It actually has happened a couple of times where students have disclosed a disability to me, and they said that they preferred not to have accommodation [...] there seems to be a hesitation in some cases for students to seek and get accommodations. […] I've had students who give me the note saying, what sorts of accommodations they need or accessibility they need, and then the student will tell me, 'Well, no. Actually, I don't need that,' and there have been other cases where I think maybe there should be some other accommodation made that's not included. […] There is a lot more out there that either students aren't self-identifying, or as an instructor that I could be picking up on that I'm not necessarily aware of.

> John: I have had students who have waited to disclose their disabilities to me halfway through the semester […] I always say, 'Okay, if you believe you have a disability […] if you had a disability in the past or any kind of support when you were in high school, I cannot help you until you go and register with disability

> services and until you provide me with the paperwork.' So I make a big deal about it, because you know, [there are] a lot of people who don't know they are dyslexic. [There are] a lot of people who only are going to be able to realize that now.
>
> Judy: When they come talk to me, I don't know what [it is] that they have. They don't share with me what is their disability. […] But we're very restricted in the classroom, because we don't actually know what [it is] that the students need. […] We try to be aware, and we identify a student that may need help, but I cannot ask a student 'Hey, I noticed that you may need this,' because I cannot do it.
>
> Mary: Normally, they do not disclose their needs immediately. It takes a while, and I don't know if [it is] because the paperwork takes a while, or if [it] is because it's difficult for a student to approach and say I need something special here, and they do not disclose, really disclose to you.

SWDs may not disclose learning needs. Findings within this theme suggest participants perceived SWDs should be provided accessible curriculum and materials. Due to non-disclosure and lack of knowledge of the needs of SWDs, two participants also suggested it is important to provide materials in multiple formats to accommodate the possible, but unknown, needs of SWDs:

> John: One of the things I really liked […] was the idea of instead of creating a class, instead of having to go back and create materials to accommodate a specific student, to go ahead and have materials generally produced in a way that would be accessible to students with the predominant vision impairment, hearing impairment, those kinds of things…
>
> Judy: Well, I think the easiest [need to address] is to provide different formats, to make sure that, when I'm teaching, they get information in different formats so everybody can understand and provide them with opportunities to test them in different skills. […] So I think that people need to be aware maybe information that is easy for some is not going to be easy for all, so try to present the content of the classroom in different formats.

The needs of SWDs parallel the needs of all learners. Findings within this theme suggest participants perceived the needs of SWDs parallel the needs of all learners. Additionally, although the guiding research questions and line of inquiry explicated the

needs of SWDs, all participants appeared to envision the broader needs of all of their students rather than the needs of SWDs alone:

> Robert: I tend to frame things more in terms of addressing all students […] I haven't given as much thought, usually, in my planning to have it address the needs of students with disabilities.
>
> John: I think that my overall impression is based on that concept of designing your classroom for everyone from the start as opposed to designing your classroom for this kind of learner […] I would like to think more along those terms.
>
> Judy: I would not say this only [for] students with disabilities, but for all students. I mean they [the UDL guidelines] will give you ideas. I mean, they're great ideas. Why not use them not only for the ones with disabilities, but for them [students without disabilities]?
>
> Mary: I think all the students have special needs, not special needs [of] the bad concern, but [of] the concern that each one is an individual [learner]. […] I think all [needs are] important. I don't know, even the smartest kid in my classroom is important, because I want to push the student to be better. […] There [are] so [many] benefits that can be for any student.
>
> William: The difficulties faced by most students with disabilities are the same as those faced by other students. It's a matter of degree, usually not of kind. [...] All students have a hard time hunkering down, focusing on work, [and] paying attention to what they're doing and not being distracted.

Likewise, all participants perceived the needs of SWDs parallel the needs of all students in that they may have learning differences; however, all could benefit from materials provided in multiple formats and accommodations such as extra testing time:

> Robert: … and so I just never framed it that way of it being not only as general considerations for the class, but also something that could be beneficial for students with needs for disabilities. So maybe not just thinking of that as something to present more variety to students, but also as something that can help students achieve better, no matter what their needs are.
>
> John: I have to circumlocute in order to describe or give minimal information in order that they can put together what they need, and that's helped me be able to provide the same material to all of the students in the classroom, and realize that they [all] also do well with that kind of input.

> Judy: I mean, those needs could be addressed like they would benefit all students, and I could make general things, but, as I said before, go into the detail of what you do, since I don't know what is it that the students require, because I don't do it in the class.
>
> Mary: I think all the students have special needs, not special needs [of] the bad concern, but [of] the concern that each one is an individual [learner].
> William: In many respects, they're completely parallel. Students need the same—the difficulties faced by most students with disabilities are the same as those faced by other students.

A variety of tools are needed to meet the needs of all learners. Findings within this theme suggest participants perceived a variety of tools would be needed to meet the needs of SWDs and all learners. Three participants suggested a variety of technologies would be needed, and would be based on individual needs of students:

> John: … for me, it's about the individual needs of a student. So, in that instance of the student that came who came to my classroom, sound blocking earphones would have been great so that he could put on the music that would be good for him, and to be certain, he's not hearing anything else. For [students who do not have something] sent through a reader like a braille reader, the Word accessibility features are nice. […] So I'm not sure if I can say what's needed. I just know that there's been times where a technology would have been nice or where technology was useful.
>
> Mary: All of them […] visual, recording, everything that could enhance and provide different ways and to teach.
>
> William: Well, that would vary based on the type of disability in question. […] I can imagine there could be, there are a wide range of tools that are available. […] That if it was a useful tool, it would be useful for a wide range of students. I'm not a big fan of the notion of learning styles, that students are programmed into specific learning styles. I think that's a very limiting way of describing the learning process. But tools that hit more of those different channels are more likely to be effective with a larger number of students.

Benefits and Barriers to Applying Technology-Enriched UDL Strategies

This section discusses findings related to the benefits and barriers to applying technology-enriched UDL strategies, according to the participants. Within this major theme, findings also revealed participants perceived: (a) technology reduces barriers to

learning, (b) technology enables self-regulation and customization of learning, (c) technology-enriched UDL strategies are helpful in general, (d) technology may create barriers to UDL implementation, and (e) specific guidelines can be a barrier to UDL implementation. Described below is an overview of the major theme and sub-themes, along with supporting examples of participant responses collected during the study.

Technology reduces barriers to learning. Findings within this theme suggest participants perceived technology reduces barriers to learning. Three of the five participants perceived technology reduces barriers for SWDs in a number of ways including: the provision of instructional materials outside of class, engagement of students in a more comfortable environment, and the provision of accommodations. Examples of these responses are provided below.

> Robert: … their disability also makes it difficult to discuss things in class. So having the opportunity to have interactions with the instructor, and with other students, in a virtual format I think could help those students.
>
> John: … but she had her reader in class, and she always had the PowerPoints ahead of time. So she could easily read what we were going over. All the activities were there from the book. Everything was there in her reader. So here we have a completely blind student who is fully participating in a foreign language class, which relies upon a lot of visual interaction, and I thought that was a success. It was a lot of work, but it was a success.
>
> Judy: … their anxiety level, it's going to be lower. They would be in an environment [in which] they feel safe to express themselves.

Participants suggested such strategies may also help to reduce anxiety and increase comfort levels of students. Likewise, two of the five participants suggested technology would enable collaboration and opportunities to learn from and collaborate with other students.

Technology enables customization and self-regulation of learning. Findings within this theme suggest participants perceived technology enables customization and

self-regulation of learning. Responses from participants indicated they perceived technology provides opportunities for: gauging progress, student-driven learning, monitoring progress, and the provision of materials in multiple formats. Examples of these responses are provided below.

> Robert: That's something that could be developed for students overall, and specifically for students with learning needs, for them to be able to gauge their own progress, as well as for me to see how they're doing. […] They could prepare on their own in terms of the exam as opposed to being reliant on the in-class times where I'm there to ask questions…
>
> John: I know that it [technology] can [provide customization for students with disabilities]. For instance, on [the LMS], I know that you can go in and give individual permissions to people. Like, for instance, let's say if I have a recording up there, but I only want the students to access it twice. I know that on [the LMS] you can go and give certain people more access. That, I feel like is beneficial to accommodating students with particular needs. […] So the only thing that wasn't individually driven was what we did in class. They could go as far down the road as they wanted. They had to reach a certain point, but they could get there however they wanted to get there.
>
> Judy: I would be able to provide them with materials in different formats that help them […] the students with disabilities, of course, they would benefit greatly because I would be able to monitor them closer, to be [available] more time with them, to make sure that whatever I'm providing is working.
>
> Mary: It gives them options, but not all technologies. We have the textbook homework, they hate it. […] Then, what I am doing is I am creating materials that are more direct to my teaching style and their needs, and they love it. […] Then, I continue implementing and getting better from the [feedback] and changing things

Technology-enriched UDL strategies are helpful in general. Findings within this theme suggest participants perceived technology-enriched UDL strategies are helpful in general. As the dialogue emerged, participants suggested UDL encourages: expression of learning in a variety of ways, more well-rounded instruction, more proactive course design, more structure for lesson planning, and greater understanding of learning needs. Examples of these perceptions are provided below.

> Robert: It's good to have a variety of media, a variety of ways for students to express themselves, and trying to meet the guidelines for UDL will help with doing that. […] If I sit down and if I plan my next lesson with these three things in mind, and then also the subsequent strategies, I think that I'm going to provide a more well-rounded presentation and educational experience for the learner, regardless, than the way I do it now. […] [UDL] is based on that concept of designing your classroom for everyone from the start as opposed to designing your classroom for this kind of learner.
>
> Judy: I think [UDL] provides […] a good framework for you to structure your lessons [...] So that's where I think technology comes so handy, because they can express … they can show you what they are learning, in a better environment for them. [...] So if I had those guidelines applied to them since day one [...] then they would know what they have. They would use what they need [and] give you feedback about what is working, what isn't working, instead of you trying to change things all the time.
>
> Mary: You have to be open and looking and [listening] and [paying] attention to your students [...] It's an understanding of what each one individual needs are regardless of the need.
>
> William: The notion of accounting for a range of possible needs in advance sounds like good planning. It sounds like a wise strategy. [...] chances are the curriculum that's designed with more universal design characteristics is also probably a more carefully designed curriculum overall.

Technology can be a barrier to UDL implementation. Findings within this theme suggest participants perceived technology can be a barrier to UDL implementation. Participants perceived the department seems to be behind in their use of technology; some strategies or tools may not be as accessible as others; faculty may lack knowledge as to how certain technologies work; students may lack technology competencies; and technology may be unavailable due to lack of access or funding. Identified below are examples of how participants perceived barriers to technology-enriched UDL strategies.

> Robert: I think sometimes it's difficult for me to see how concretely I would be able to implement [technology-enriched UDL strategies]. […] on my end, and, I think, on many teachers' ends, we don't really know how [accessible technology] works … so I know the technology is out there … and I've used other technologies that can be used, like video and blog and such. It's just a matter of applying that better to students with disabilities. […] foreign languages generally

seem to be a little bit further behind maybe some other areas.

> John: … and then there's the question also, with any technology, is the student trained? Is the student capable? Do they have certain technological competencies in order to be able to use that? […] That's a wonderful idea … but it's a public university. We're an urban university. We have a good percentage of our students who take the bus to school in a city where the bus system is not good … and all that's financially motivated. […] So this is actually where I feel like I need to be trained, because I don't know. [...] And it's not using technology in the classroom that's the problem. It's the dynamic use of technology in the classroom at multiple levels and multiple access points.

> Mary: Even though it's available for everybody, not everybody has [it]. Even today in our classes, not everybody has a phone, not everybody has access to everything even though it is not so expensive. One very important thing is how to use it. They don't know how to use other than text message or taking pictures. [...] It's a lack of knowledge of using that properly.

> William: In the language I'm teaching, I remain unaware of very many resources out there. It's not to say that they don't exist. I haven't seen them. There may be things that exist behind pay walls. There may be things that if I [were] more closely-connected to the language instruction community, I would know more about. But I'm new at this. [...] The barrier may be availability … that things that I wish existed don't exist yet. […] I found when starting to teach this class and looking for material online, looking for online tools, looking for anything beyond the textbook, I didn't find that I had access to very many things that were new and up to date.

Specific guidelines can be a barrier to UDL implementation. Findings within this theme suggest participants also perceived requirements related to specific UDL guidelines can be a barrier to UDL implementation. All five participants perceived certain aspects of the UDL framework would be challenging to implement. Perceived challenges and barriers included: helping students to gauge their progress, lack of time to implement flexible strategies, engaging students in multiple ways, encouraging use of self-assessments, encouraging students to express their knowledge in more than one format, and helping students stay motivated and engage in goal-setting activities. Identified below are examples of how participants perceived such barriers.

> Robert: [Allowing students to gauge their progress] will be difficult because, generally, we have punctual [assessments] such as tests, as opposed to ongoing assessments…. and [...] there would be a challenge of allowing the instructor to have as much flexibility as possible to work with students based on their needs…
>
> John: If I were to spend more time getting to know UDL, and understand UDL, and see more things like […] the examples that were provided, I think that I probably would [apply technology-enriched UDL strategies.] […] I don't do what I would love to do … and part of it is because I don't know how to do it and to reach out to all of those different learning styles […] I don't think that there is enough time spent training teachers in terms of being able to recognize what are the needs of students, to be able to identify them, and to be able to deal with them.
>
> Judy: So instead of teaching, I don't know, ten lessons in a semester, maybe you teach five … but those five lessons you [are] providing [them] with a very comprehensive instruction, so they are involved in the communities, that they can do the blog, that they can do research. […] So I think it's very hard for a student to, since they don't know what is it that they are going to learn how to [do] at this point, [...] and start, like, monitoring their own performance in the class. I think that's hard. […] I guess a barrier would be how to balance that in the classroom so it is not too much or not enough.
>
> Mary: I know that now it's required for us to have at least a syllabus accessible for everyone. But the little training [that] we received on that is very weak. I wish I had more training.
>
> William: The area of an executive function, that whole family of ideas, are … I don't know. I suppose they're somewhat hazier, but they're somewhat more abstract. [...] It kind of sounds and feels like it's in the area that's outside of my control standing in front of a classroom … and probably […] harder to conceptualize and harder to implement.

Impact of UDL-Focused Professional Development on Faculty Perceptions and Practice

This section discusses findings related to the impact of UDL-focused PD, such as the online module on technology-enriched UDL strategies on faculty perceptions and practice. It should be noted, however, that indicators of the impact of such PD, in some instances, are based on expressed perceptions by the participants in this particular study. Further studies should be conducted to explicitly measure in what ways such PD has a direct impact on faculty perceptions. Within this theme, findings revealed the possible

impact on: (a) perceptions about UDL, (b) perceptions about technology integration, (c) ideas for learner-centered instruction and technology integration, and (d) ideas for applying technology-enriched UDL strategies. Described below is an overview of the major theme and sub-themes, along with supporting examples of participant responses collected during the study.

Impact on faculty perceptions and awareness about UDL. Findings within this theme suggest participants perceived the online module had an impact on their perceptions and awareness of the UDL framework in general. With the exception of one participant, faculty indicated they had not received formal training or PD on UDL. Likewise, it appeared perceptions of UDL were largely contextualized in the unique experiences and observations of each participant. For this reason, each participant exhibited an autonomous view and perception of PD and related needs. Most participants initially indicated they had no prior knowledge or awareness of UDL; for this reason, in addition to the perceptions below, it can be assumed that, for all but one of the participants, the module increased awareness to some degree about UDL. Examples of participant perceptions related to the impact of the online module are identified below.

> Robert: I would say that it's made me more aware of the need to do not just accommodations after the fact, but also to be planning for our students who have different disabilities. […] I would say I have a better understanding of what it is. […] So for me, it's clearer than it used to be… and I was happy to see that you say that that's something that I could possibly have access to in terms of being able to use that as guidelines in the future to help think about as an instructor, and also with my colleagues, how we might utilize UDL. […] But I remember that they did talk about several other ways that they're addressing the test to make them more accessible. And you mention the possibility of kind of bringing UDL into the discussion in that aspect. So it's interesting.
>
> John: I had no prior knowledge of UDL.
>
> Mary: ... you need to be […] more open, that all students are different, and that as a teacher, well, we already know that, but you need to be very aware of what is it

> that they need, and to understand what works for one person is not going to work for the other one. […] I wasn't [previously] aware [of UDL]. […] when I started reading the module, it's not [about students with disabilities]. It's for looking at all the students in particular, not the ones that are not capable of doing, but all of the students. […] I didn't know there was so many classifications and so many details involved [in UDL].
>
> William: That third category of engagement, it's not even sticking in my memory, but that is not something that I guess I had previously had associated with [UDL] and I'm still assimilating.

Impact on faculty perceptions about technology integration. Findings within this theme suggest participants perceived the online module had an impact on their perceptions about technology integration. Identified in this section are key areas related to the perceived impact of UDL-focused PD on ideas for technology integration. These perceptions included: a greater awareness of the different uses of technologies to meet the needs of SWDs and the need to accommodate; more possibilities for use of technologies; and more specific ideas for technology integration. Examples of these perceptions are identified below.

> Robert: I would say that it's made me more aware of the different uses of different technologies. I generally see technology as something that can be used to help the broader student population in terms of getting them more exposed to culture, of different ways of practicing and learning the language, but I haven't been seeing [it] as much as a way of including students with disabilities and adjusting their needs. So I would say that the module really helped me with that […]that UDL doesn't necessarily have to be a constraint. That it may also be a way of using technology in different ways that can help students both with needs, with special needs, and the broader population as well.
>
> John: … [about] meeting the needs of students in general, I think, yes, because of the holistic manner, because of the fact that it is another way of trying to help us look at the student as a whole, but at the same time, looking at the variety of students in the classroom.
>
> Judy: I would not say this [UDL is not] only [for] students with disabilities, but for all students. […] So it's more like they reassured that yes, you need to do it. It's not something that you can leave behind and [assume], Well, I don't care. They will provide accommodations somewhere else, or let somebody else deal with it.'

> Mary: My idea is that we still do not use enough to accomplish the needs of our students. […] I know technology can help them. The module was good to [emphasize] the possibilities of doing technology with them, [as well as] other possibilities.

Impact on ideas for technology integration. Findings within this theme suggest the online module may have had an impact on participants' ideas for technology integration. Within this theme, faculty expressed early ideas related to more learner-centered and flexible approaches to integrating technology, including: publishing to a blog for peer review, using Web-based resources for self-paced review, collaborative peer-editing, and other uses of technology that address multiple modalities. Examples of these ideas for applying technology are identified below.

> Robert: So allowing learners the flexibility and the ability to track their progress, and to work based on what their needs are, while still making sure that they're progressing at the rate that we would need them to get to the next class, basically. […] also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students, for their own purposes, as well as for other students to react to it and to benefit from it. […] they could prepare on their own in terms of the exam, as opposed to being reliant on the in-class times where I'm there to ask questions. [It] could be useful for students that have access to that later to see for themselves how they did, to see what sorts of mistakes or some of the strengths of how they did.

> John: … the stuff that's missing for me is the collaborative peer editing before it comes to me […] So you share the link with whomever you want to share it with in the class, make sure that I can see who it is, or identify for me who has been on this, and then let them give feedback, because I feel like that is an important step [in] utilizing technology that Google Docs allows. […] Whereas if I were to do a module like that, it would allow them to practice it outside of class, to access it out of class, and not be like this situation where they need someone else.

> Judy: I mean, it would be perfect if you can use those technologies so the students can use them to address their needs, because, I think, with technologies I am being more proactive […] They have the formats, they have the different outlets for that information,[…] they know where they stand, […] they know what is it that they need to do to get the goal that they need in this class, and then […] they can show to me and to them that they understand through all the different resources [technologies] that we give them to complete their homework, their assessments.

> William: Well, the idea would be to have something [a technology] that's addressing multiple modalities simultaneously. It's not just operating in the visual track. It's not just operating in the auditory track. There are multiple tracks that are activated simultaneously, which presumably would allow someone who has […] greater facility with one of those tracks and lesser facility with another track to have a roughly comparable experience.

Four of the five participants also considered engaging SWDs by providing materials in multiple formats and applying a variety of technologies. However, in some cases, participants did not differentiate between which technologies would be most appropriate, although they reported considering multiple modalities in their instruction.

> Robert: But one way that could be adapted to further address people with different needs would be for there to be a written component to it as well. So not just having the two or three minutes of the student […] presenting in front of the class, but also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students […] So I would say that would be a major lesson that probably could be rethought, and more technology and different activity types could be included.

> Judy: So I give them materials so they can watch things that, since we don't have the time in class, they can do it at home. They can take all the time they want to do it. […] And they do their homework online, and I give them assignments. […] We have very different formats in order for me to make sure that they're understanding the content. […] They have the formats—they have the different outlets for that information.

> Mary: They can have anything that they want… a computer, a tablet, or phone, anything that they could use to create anything that they want to create.

Ideas for applying technology-enriched UDL strategies. Findings within this theme suggest the online module may have had an impact on participants' ideas for applying technology-enriched UDL strategies. As conversations emerged from the accommodation process to the application of UDL guidelines, fewer themes were evidenced among the responses. It should also be noted that participants' ideas were just forming at the time of the study; more studies should be conducted with follow up PD opportunities to determine how such ideas emerge over time. Identified below are

examples of how participants discussed their ideas for technology-enriched UDL strategies and related activities.

> Robert: …in terms of our presentations, we have oral presentations at the end of all of our courses for the elementary and intermediate level. […] they can use PowerPoint or Prezi or bring in realia, real objects, but one way that could be adapted to further address people with different needs would be for there to be a written component to it as well. So not just having the two or three minutes of the student that's presenting in front of the class, but also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students, for their own purposes, as well as for other students to react to it and to benefit from it.
>
> John: I love the idea of a portfolio […] for the entire basic program that when a student who is required to take four courses of language, which is a lot. […] So I feel like if they could have a portfolio at the end of that, they'd be able to look back and say, 'That's right. I can do this.' […] I guess one thing that, allowing for variety, is that it does allow the student to come at it from their own experience.
>
> Judy: So I give them materials so they can watch things that, since we don't have the time in class, they can do it at home. They can take all the time they want to do it […]and they do their homework online, and I give them assignments. […] We have very different formats in order for me to make sure that they're understanding the content. So that's what I'm using right now […] I think the chats, I mean online, that they would be able to talk to each other, get to know them [the students] so they could relax while talking themselves...
>
> William: I'm teaching language at such an elementary level that […] I've got one thought running through my mind. My students last semester asked if there were any online tools that would help, kind of a flash card learning tool kind of thing to help them learn the […] alphabet. I did stumble on something recently, but I didn't have it last semester when they were learning the alphabet. So that would be one instance of something.

Summary

The purpose of Chapter 4 was to report on major findings from the analysis of data collected during the interview process. Three themes emerged among the data, including: awareness of learner variability and the challenges faced by SWDs, benefits and barriers to applying technology-enriched UDL strategies, and the impact of UDL-focused PD on faculty perceptions and practices. Each section in this chapter provided an

overview of participant responses and narratives related to the major themes and subthemes that emerged during the study. Excerpts from the interview process are also cited as a means of identifying faculty perceptions related to each of the themes, and how such perceptions may have been impacted by an online module on technology-enriched UDL strategies.

Chapter 5: Discussion

The findings reported in the previous chapter account for the perceptions of faculty about the needs of SWDs, the application of technology to meet the needs of SWDs, and technology-enriched UDL strategies. In Chapter five, these findings are discussed in reference to each of the research questions and findings within the review of literature. This chapter is divided into six sections, including: (a) RQ 1: What are the perceptions about the needs of SWDs?, (b) RQ2: What are the perceptions about the application of technology to meet the needs of SWDs?, (c) RQ3: How do faculty consider applying technology to meet the needs of SWDs?, (d) RQ4: What are the perceptions of faculty about the application of technology-enriched UDL strategies?, and (e) conclusion, and (f) recommendations. RQ2 and RQ4 are addressed collectively as the findings related to the literature may overlap considerably. Through the lens of each of the research questions and previous studies, contributions made by this study to current and future research will also be considered in the conclusions section of this chapter, along with recommendations for future studies based on findings addressed and not addressed by this study.

RQ1: Perceptions about the Needs of Students with Disabilities

This section discusses the findings regarding faculty perceptions about the needs of SWDs. Findings primarily revealed pre-existing and current faculty perceptions about these needs, and suggest prior PD may have had an impact on these perceptions. The following discussion provides an overview of the literature related to RQ1, as well as related findings and examples from participant responses during the study.

Overview. Current literature suggests faculty should provide UDL supports that are accessible to all learners, not just those with disabilities (Rose, 2006). Likewise, as noted by several participants in the study, the needs of SWDs may not always be clear, as SWDs may not always request accommodations due to self-perceptions of their disability (Scott et al., 2010). For this reason, UDL aims to help faculty create learning environments that provide supports accessible to all learners (Rose, 2006). Likewise, previous studies have indicated both students with and without disabilities alike may equally benefit from UDL-aligned materials (Kennedy et al., 2014; Marino et al., 2014).

Despite awareness of the need for inclusive education and UDL integration, the needs of SWDs may not always be addressed in inclusive environments (Spooner et al., 2007). Previous studies have also shown faculty, as they may feel ill-prepared to work with SWDs, may rely on centralized support services in order to accommodate students (Orr, 2009). However, students who are not asked to disclose learning needs at the beginning of a course may be less likely to perceive the instructor as creating a positive learning environment (Scott et al., 2010). Likewise, accommodations may not always match the needs of some students (Black, Weinberg, & Brodwin, 2015). A discussion of literature related to these key issues, the needs of SWDs, and related findings are identified below.

Discussion of literature and findings. Findings in the literature suggest faculty who participate in UDL-focused PD may demonstrate an increased awareness of the needs of SWDs and increased awareness of learner variability (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012). This awareness was also evidenced within the responses of two faculty in the case study:

> John: … have materials generally produced in a way that would be accessible to students with the predominant vision impairment, hearing impairment […] here we have a completely blind student who is fully participating in a foreign language class, which relies upon a lot of visual interaction, and I thought that was a success.
>
> Mary: I think all the students have special needs […] each one is an individual [learner].

As SWDs may comprise over 11% of the total student population (U.S. Government Accounting Office, 2009; National Center for Educational Statistics, 2006), faculty are likely to work with SWDs (Okolo &Diedrich, 2014). However, findings suggest faculty did not perceive the broad variety of the types of disabilities that may be evidenced in their classroom, nor that the largest population of SWDs are those with learning disabilities (Orr, 2009). Findings in the literature also suggest such students face significant challenges and barriers in the traditional classroom, and are often subject to anxiety and low confidence (Demuth & Smith, 1987; Downey & Snyder, 2001; Javorsky et al., 1992), and may suffer embarrassment, stress, and anxiety due to complications with speech articulation and auditory processing, among other barriers to language acquisition (Scott et al., 2010). As indicated in previous literature, participants also highlighted barriers and challenges for SWDs, including: anxiety, hesitation to request accommodations, difficulty focusing, and difficulty participating in class.

> Robert: There seems to be a hesitation in some cases for students to seek and get accommodations […] their disability also makes it difficult to discuss things in class.
>
> Judy: … their anxiety level, it's going to be lower. They would be in an environment [in which] they feel safe to express themselves.
>
> William: All students have a hard time hunkering down, focusing on work, [and] paying attention to what they're doing and not being distracted […] the difficulties faced by most students with disabilities are the same as those faced by other students.

Likewise, accommodations do not always match the needs of some students (Black et al, 2015), suggesting more proactive approaches may be required to meet the learning needs of SWDs. As indicated by faculty in the study, content should be presented in different formats and be designed for all students from the start.

> John: ... the concept of designing your classroom for everyone from the start as opposed to designing your classroom for this kind of learner […] I would like to think more along those terms.
>
> Judy: … information that is easy for some is not going to be easy for all, so try to present the content of the classroom in different formats.
>
> Mary: ... you need to be very aware of what is it that they need, and to understand what works for one person is not going to work for the other one.

While the ability of students who participate in general education courses may be linked to educators who understand the learning needs of students (Basham et al, 2013), not all participants indicated they had experience teaching SWDs nor indicated they were familiar with these needs. Participant 3, for example, indicated, "I am completely out of the loop accommodating SWDs, because I haven't had anybody that in class requires a special accommodation." Experience teaching SWDs may have had an impact on the perceived need to rely heavily on the accommodation process. Likewise, the needs of SWDs may not always be clear, as SWDs may not always request accommodations due to self-perceptions of their disability (Scott et al., 2010), or may choose to leave such needs undisclosed to faculty, such as learning disabilities (Orr, 2009). While learning disabilities were clarified as the most prominent disability type prior to the interview, participants infrequently referenced this type of disability in their responses; this suggests participants may be more comfortable or more familiar with the needs of students with other types of disabilities. This lack of familiarity with various types of disabilities

indicate faculty may not be aware of the most prominent disability types, such as learning disabilities and ADD/ADHD (NCES, 2011).

Likewise, even when the needs of SWDs are known, accommodations may not always match the needs of some students (Black et al., 2015); for this reason, faculty should consider providing instruction proactively in an accessible format. As participants considered the design of accessible instruction as an alternative to providing accommodations, they also suggested SWDs may be unlikely to disclose. Previous studies parallel this issue, indicating such students may not request accommodations due to self-perceptions of their disability (Scott et al., 2010).

> Robert: There [are] a lot more [needs] out there that […] students aren't self-identifying.
>
> Judy: When they come talk to me, I don't know what [it is] that they have.
>
> Mary: Normally, they do not disclose their needs immediately.

Previous studies have shown faculty, as they may feel ill-prepared to work with SWDs, tend to rely on centralized support services in order to accommodate students (Orr, 2009). Similarly, responses indicated several participants expressed a lack of knowledge regarding how to identify the needs of learners, with several faculty expressing they would not be able to meet the needs of SWDs without information provided directly from the student or disabilities office. Participant 2 indicated, for example, "I cannot help you [the student] until you go and register with disability services and until you [the student] provide me with the paperwork." However, Meyer et al. (2005) suggest, “When education fails, the curriculum, not the learner, should take responsibility for adaptation” (p. 8).

Previous studies on UDL have also indicated learning environments should provide supports that are accessible to all learners (Rose, 2006). Such studies have also indicated both students with and without disabilities alike may equally benefit from UDL-aligned materials (Kennedy et al., 2014; Marino et al., 2014), and that UDL offers a helpful framework for engaging all learners, regardless of disability (Chita-Tegmark et al., 2012). With this in mind, all participants perceived the needs of SWDs parallel the needs of all students in the following ways: they have learning differences, they benefit from materials provided in multiple formats, and they benefit from accommodations such as extra time. Responses from faculty in the study also indicated they preferred to consider the needs of all students rather than just needs of SWDs when discussing instructional methodologies:

> Robert: … and so I just never framed it that way of it being not only as general considerations for the class, but also something that could be beneficial for students with needs for disabilities.[…] I tend to frame things more in terms of addressing all students.
>
> Mary: I think all the students have special needs [...] even the smartest kid in my classroom is important, because I want to push the student to be better. […] each one is an individual [learner].
>
> William: The difficulties faced by most students with disabilities are the same as those faced by other students.

RQ2 and RQ3: Perceptions and Ideas for Applying Technology to Meet the Needs of Students with Disabilities

This section discusses the findings regarding faculty perceptions about the application of technology to meet the needs of SWDs and ideas for applying technology to meet the needs of SWDs. Findings primarily revealed pre-existing and current faculty perceptions and ideas. These findings also suggest prior PD may have had an impact on these perceptions and ideas. The following discussion provides an overview of the

literature related to RQ2 and RQ3, as well as related findings and examples from participant responses during the study.

Overview. Multimedia and digital content provide flexibility in curriculum delivery and opportunities to differentiate instructional practices (Meyer & Rose, 2005). Current literature also indicates inclusive environments can be fostered through the integration of technology (Starcic & Bagon, 2014). As a result of increased enrollment of SWDs, faculty are beginning to use inclusive methodologies in order to meet the needs of their students and adopt new instructional methods and forms of assessments (Langley-Turnbaugh, et al., 2013; Orr, 2009). Likewise, previous studies suggest faculty should adopt a technology-supported inclusive approach to meet the needs of all learners (Pellerin, 2013). By aligning technology integration to the UDL framework, faculty may more effectively address two key issues pertaining to learner variability: (a) individual characteristics or disabilities which interfere with the learner's ability to access content, engage in a course, or demonstrate knowledge and (b) issues resulting from how the learning environment was designed (Rose et al., 2006). In addition, digital media provides a format that can be customized to the learner, as students vary in their strengths (Rose, 2000), and multimedia-rich approaches may help students learn more readily than with more traditional methodologies (Kennedy et al., 2014).

Previous studies have also shown when materials and technologies are aligned to UDL, and materials are provided in a format customized to the learner (Rose, 2000), students may perceive they have more control over their learning (Kumar & Wideman, 2014). Likewise, faculty may be more likely to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et

al., 2007). Such studies also consider the benefits of awareness of inclusive methodologies and frameworks such as UDL, including:

- the consideration of a technology-supported inclusive approach to meet the needs of all learners (Pellerin, 2013);
- the proactive design of inclusive instruction, rather than making accommodations after instruction has been implemented (Spooner et al., 2007);
- increased application of inclusive instructional strategies (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco et al., 2013; Moreno, 2013; Spooner et al., 2007; Scott & Edwards, 2012);
- reduced need for accommodation by disability services (Kumar et al., 2014);
- increased likelihood to apply inclusive teaching practices (Moreno, 2013);
- adjustments to the way courses are designed and delivered (Langley-Turnbaugh et al., 2013); and
- increased frequency of multimodal delivery of instruction (Langley-Turnbaugh et al., 2013).

However, when such methodologies are not considered or deeply integrated, it may result in:

- a disparity between faculty attitudes toward inclusive instruction and whether they authentically integrate inclusive practices in their teaching (Gawronski, 2014);
- innovative resources and multimedia reduced to supplementary materials with text as the primary mode of delivery (Berberi, et al., 2008);
- use of technology more frequently, but proceeding with more traditional methods of instruction (Wilson & Wright, 2011); and

- low likelihood of inclusive teaching with technology (Fuchs et al., 2013).

A discussion of literature related to these key issues, the application of technology to meet the needs of SWDs, and related findings are identified below.

Discussion of literature and findings. Studies suggest considering UDL may encourage faculty to address individual characteristics or disabilities which interfere with the learner's ability to access content, engage in a course, or demonstrate knowledge (Rose et al., 2006). This was affirmed in the study as faculty considered how the characteristics of their students could be addressed through UDL, including strategies for incorporating feedback from students and the need to address anxiety, among other issues. Responses from participants indicate they considered the individual needs of students when asked about technology integration and UDL.

> Robert: … their disability also makes it difficult to discuss things in class. So having the opportunity to have interactions with the instructor, and with other students, in a virtual format I think could help those students.
> John: … for me, it's about the individual needs of a student.

> Judy: ... their anxiety level, it's going to be lower. They would be in an environment [in which] they feel safe to express themselves. […] the students with disabilities, of course, they would benefit greatly because I would be able to monitor them closer, to be there more time with them, to make sure that whatever I'm providing is working.…

> Mary: … what I am doing is I am creating materials that are more direct to my teaching style and their needs, and they love it. […] Then, I continue implementing and getting better from [their feedback] and changing things. […] You have to be open and looking and [listening] and [paying] attention to your students [...] It's an understanding of what each one individual needs are regardless of the need.

> William: Well, that would vary based on the type of disability in question. […] But tools that hit more of those different channels are more likely to be effective with a larger number of students.

Likewise, participating in UDL-focused PD may also lead to more proactive approaches and increased awareness of inclusive instructional strategies (Higbee, 2008; Langley-

Turnbaugh et al., 2013; LaRocco et al., 2013; Moreno, 2013; Scott & Edwards, 2012, Spooner et al., 2007) including: consideration of technology-supported inclusive approaches to meet the needs of all learners (Pellerin, 2013); increased application of inclusive instructional strategies (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco et al., 2013; Moreno, 2013; Scott & Edwards, 2012; Spooner et al., 2007); likelihood to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007); and reduced need for accommodation by disability services (Kumar &Widema, 2014). Responses from participants affirmed such PD may have an impact on these approaches and encourage faculty to consider more proactive approaches to designing instruction that meet the needs of a broader audience of students:

> Robert: It's good to have a variety of media, a variety of ways for students to express themselves, and trying to meet the guidelines for UDL will help with doing that. […] If I sit down and if I plan my next lesson with these three things in mind, and then also the subsequent strategies, I think that I'm going to provide a more well-rounded presentation and educational experience for the learner, regardless, than the way I do it now. […]So allowing learners the flexibility and the ability to track their progress, and to work based on what their needs are, while still making sure that they're progressing at the rate that we would need them to get to the next class, basically. […] they could prepare on their own in terms of the exam, as opposed to being reliant on the in-class times where I'm there to ask questions.
>
> Robert: I would say that it's made me more aware of the different uses of different technologies. [...] UDL doesn't necessarily have to be a constraint. That it may also be a way of using technology in different ways that can help students both with needs, with special needs, and the broader population as well.
>
> John: ... the concept of designing your classroom for everyone from the start as opposed to designing your classroom for this kind of learner […] I would like to think more along those terms. […]One of the things I really liked […] was the idea of instead of [...] instead of having to go back and create materials to accommodate a specific student, to go ahead and have materials generally produced in a way that would be accessible to students with the predominant vision impairment, hearing impairment, those kinds of things…

> Judy: ….people need to be aware maybe information that is easy for some is not going to be easy for all, so try to present the content of the classroom in different formats. […] I mean, it would be perfect if you can use those technologies so the students can use them to address their needs, because, I think, with technologies I am being more proactive […] they can show to me and to them that they understand through all the different resources [technologies] that we give them to complete their homework, their assessments.

Previous studies have also shown when materials and technologies are aligned to UDL, and materials are provided in a format customized to the learner (Rose, 2000), students may perceive they have more control over their learning (Kumar & Wideman, 2014). In some cases, participants did not differentiate between which technologies would be most appropriate, although they reported considering multiple modalities in their instruction, and flexible approaches to engaging students with technology. Several participants also explicitly considered applying technology in order to help students regulate their own learning. One of the participants indicated they could use video for the purposes of reflection and self-regulation, while another participant explicated an idea for using portfolios to monitor progress.

UDL-focused PD may lead to an increased frequency of multimodal delivery of instruction (Langley-Turnbaugh et al., 2013). Likewise, multimedia content provides flexibility in curriculum delivery and opportunities to differentiate instructional practices (Meyer & Rose, 2005). Such technologies may help to promote flexible, cost-effective ways to individualize learning (CAST, 2015), and provide a format that can be customized to the learner (Rose, 2000). Three of the five participants in this study also suggested such technologies reduce barriers and increase flexibility for SWDs by providing instructional materials outside of class, engaging students in an environment comfortable for them, and providing accommodations:

> Robert: It's good to have a variety of media, a variety of ways for students to express themselves, and trying to meet the guidelines for UDL will help with doing that.[…] I would say that it's made me more aware of the different uses of different technologies. […] That it may also be a way of using technology in different ways that can help students both with needs, with special needs, and the broader population as well. […] also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students, for their own purposes, as well as for other students to react to it and to benefit from it. […] they could prepare on their own in terms of the exam, as opposed to being reliant on the in-class times where I'm there to ask questions. […] one way that that could be adapted to further address people with different needs would be for there to be a written component to it as well. So not just having the two or three minutes of the student […] presenting in front of the class, but also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students.
>
> Judy: I mean, it would be perfect if you can use those technologies so the students can use them to address their needs, because, I think, with technologies I am being more proactive […] They have the formats, they have the different outlets for that information […] I would be able to provide them with materials in different formats that help them […] the students with disabilities, of course, they would benefit greatly because I would be able to monitor them closer, to be there more time with them, to make sure that whatever I'm providing is working. […] have very different formats in order for me to make sure that they're understanding the content. […] They have the formats—they have the different outlets for that information.
>
> Mary: All of them […] visual, recording, everything that could enhance and provide different ways and to teach. ….] They can have anything that they want… a computer, a tablet, or phone, anything that they could use to create anything that they want to create.

Faculty may also exhibit mixed perceptions about the support received for technology integration (Okolo & Diedrich., 2014), or perceived barriers to technology including a lack of PD and a lack of access to technology and funding (Okolo & Diedrich, 2014). Similar perceptions were also evidenced in the study by three of the participants.

> John: … but it's a public university. We're an urban university. We have a good percentage of our students who take the bus to school in a city where the bus system is not good … and all that's financially motivated.
>
> Mary: Even though it's available for everybody, not everybody has [it]. Even today in our classes, not everybody has a phone, not everybody has access to

everything even though it is not so expensive.

> William: In the language I'm teaching, I remain unaware of very many resources out there. It's not to say that they don't exist. I haven't seen them. […] The barrier may be availability .... that things that I wish existed don't exist yet.

Faculty may also indicate they have a low perception of their knowledge of specific uses of assistive technology (Okolo & Diedrich, 2014). This was also evidenced by participants in the study, specifically when discussing technology competencies of both faculty and students:

> John: … with any technology, is the student trained? Is the student capable? Do they have certain technological competencies in order to be able to use that? […] So this is actually where I feel like I need to be trained, because I don't know. [...] And it's not using technology in the classroom that's the problem. It's the dynamic use of technology in the classroom at multiple levels and multiple access points.

> Mary: My idea is that we still do not use enough [technology] to accomplish the needs of our students. […] I know technology can help them.

> Robert: ... on my end, and, I think, on many teachers' ends, we don't really know how [accessible technology] works […] foreign languages generally seem to be a little bit further behind maybe some other areas

In addition, previous studies have shown that resources and multimedia may be reduced to supplementary materials, with text as the primary mode of delivery (Berberi et al., 2008), and that faculty may use technology more frequently, but proceed with more traditional methods of instruction (Wilson & Wright, 2011). Studies have also shown faculty may demonstrate a low likelihood of inclusive teaching with technology (Fuchs & Akbar, 2013). These findings were also affirmed in the study as faculty indicated they were thinking more traditionally about instruction including: (a) the need for standardized, timed assessments and (b) discomfort with allowing students to have more control over their learning, such as monitoring their own progress:

> Robert: [Allowing students to gauge their progress] will be difficult because, generally, we have punctual [assessments] such as tests, as opposed to ongoing

assessments…

> Judy: So I think it's [gauging progress] very hard for a student to, since they don't know what is it that they are going to learn how to [do] at this point, [...] and start […] monitoring their own performance in the class.

RQ4: Perceptions about Technology-Enriched Universal Design for Learning Strategies

This section discusses the findings regarding faculty perceptions about technology-enriched UDL strategies. Findings primarily revealed pre-existing and current faculty perceptions about such strategies. These findings also suggest prior PD may have had an impact on these perceptions. The following discussion provides an overview of the literature related to RQ4 as well as related findings and examples from participant responses during the study.

Overview. UDL may be able to change teaching and learning by promoting the design of flexible instruction that takes into account multiple variables related to the context in which learning occurs (CAST, 2015). Multiple studies have highlighted the benefits of integrating UDL principles as a means of addressing learner variability (McGuire, 2011; Scott & Edwards, 2012; Scott et al., 2010; Yuval et al., 2004). Several studies have also highlighted the benefits of integrating UDL principles in the postsecondary classroom (McGuire, 2011; Scott & Edwards, 2012; Scott et al., 2010; Yuval et al., 2004). Such benefits include: narrowed grade distribution and withdrawal rates (McGuire, 2011); increased success rates (Scott & Edwards, 2012); clearer expectations; more flexibility; and perceived instructor approachability (Scott et al., 2010). A number of studies have also highlighted positive results from PD models that explicitly address UDL (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco et al., 2013; Moreno, 2013; Scott et al., 2010; Scott & Edwards, 2012; Spooner et al., 2007). A

discussion of literature related to these key issues, technology-enriched UDL strategies, and related findings are identified below.

Discussion of literature and findings. Previous studies have shown students, with and without disabilities alike, may equally benefit from UDL-aligned materials (Marino et al., 2014), and UDL offers a helpful framework for engaging all learners, regardless of disability (Chita-Tegmark et al., 2012). Likewise, UDL is based on the concept that SWDs "are seen as part of a continuum of learners with various strengths and weaknesses" (Orr, 2009). Participant responses in this study indicated they maintained a similar perception about UDL, understanding the framework addresses the needs of all learners and not just SWDs.

> Robert: [UDL] is based on that concept of designing your classroom for everyone from the start as opposed to designing your classroom for this kind of learner. […] UDL doesn't necessarily have to be a constraint. That it may also be a way of using technology in different ways that can help students both with needs, with special needs, and the broader population as well. […] and so I just never framed it that way of it being not only as general considerations for the class, but also something that could be beneficial for students with needs for disabilities. So maybe not just thinking of that as something to present more variety to students, but also as something that can help students achieve better, no matter what their needs are. […] it [UDL] is another way of trying to help us look at the student as a whole, but at the same time, looking at the variety of students in the classroom.
>
> Judy: [....] they're great ideas [the UDL guidelines]. Why not use them not only for the ones with disabilities, but for them [students without disabilities]?
>
> Mary: You have to be open and looking and [listening] and [paying] attention to your students [...] It's an understanding of what each one individual needs are regardless of the need. […] It's for looking at all the students in particular, not the ones that are not capable of doing, but all of the students. […] I didn't know there was so many classifications and so many details involved [in UDL].

Likewise, UDL has been promoted as a way to address multiple variables related to the context in which learning occurs (CAST, 2015). Responses from participants indicated they also perceived UDL as a way to contextualize the needs of individual students:

> John: … [about] meeting the needs of students in general, I think, yes, because of the holistic manner, because of the fact that it is another way of trying to help us look at the student as a whole, but at the same time, looking at the variety of students in the classroom.
>
> Mary: You have to be open and looking and [listening] and [paying] attention to your students [...] It's an understanding of what each one individual needs are regardless of the need. […] you need to be […] more open, that all students are different, and that as a teacher, well, we already know that, but you need to be very aware of what is it that they need, and to understand what works for one person is not going to work for the other one. […] It's for looking at all the students in particular, not the ones that are not capable of doing, but all of the students.
>
> William: The notion of accounting for a range of possible needs in advance sounds like good planning.

In addition, UDL promotes engaging students in active learning, with the goal of helping all students become expert learners (Basham et al., 2013). There may also be a relationship between UDL implementation, and student engagement and interest (Smith, 2012). With this relationship in mind, participants indicated they perceived UDL as a means of designing instruction that engages learners by allowing students to gauge progress and address learning from their own perspective:

> Robert: […] allowing learners the flexibility and the ability to track their progress, and to work based on what their needs are, while still making sure that they're progressing at the rate that we would need them to get to the next class, basically. […] also have them publishing a blog or somehow putting the information that they've found out for their presentation out there for other students, for their own purposes, as well as for other students to react to it and to benefit from it. […] they could prepare on their own in terms of the exam, as opposed to being reliant on the in-class times where I'm there to ask questions. [It] could be useful for students that have access to that later to see for themselves how they did, to see what sorts of mistakes or some of the strengths of how they did.
>
> John: I love the idea of a portfolio […] for the entire basic program that when a student who is required to take four courses of language […] So I feel like if they could have a portfolio at the end of that, they'd be able to look back and say,'That's right. I can do this.'
>
> William: That third category of engagement, it's not even sticking in my memory, but that is not something that I guess I had previously had associated with [UDL]

and I'm still assimilating.

Faculty, however, may demonstrate a lack of familiarity with UDL (Black et al, 2014). This lack of familiarity was exhibited by several of the participants, along with indicators they would like to learn more about the framework:

> Robert: I think sometimes it's difficult for me to see how concretely I would be able to implement [technology-enriched UDL strategies]. […] on my end, and, I think, on many teachers' ends, we don't really know how [accessible technology] works […] foreign languages generally seem to be a little bit further behind maybe some other areas.

> John: If I were to spend more time getting to know UDL, and understand UDL […] I think that I probably would [apply technology-enriched UDL strategies.] […] I don't do what I would love to do … and part of it is because I don't know how to do it and to reach out to all of those different learning styles […] I don't think that there is enough time spent training teachers in terms of being able to recognize what are the needs of students, to be able to identify them, and to be able to deal with them.

> Mary: My idea is that we still do not use enough to accomplish the needs of our students. […]I know that now it's required for us to have at least a syllabus accessible for everyone. But the little training [that] we received on that is very weak. I wish I had more training. […]I wasn't [previously] aware [of UDL]. […] I didn't know there was so many classifications and so many details involved [in UDL].

Previous studies indicate faculty may also perceive UDL through an instructor-centered lens, and remain focused on the personal implications of UDL (LaRocco, 2013). They may also assign lower importance to providing choices in assessment methods (Black et al., 2014). These indicators, as well as faculty responses in the study, suggest faculty may continue with more traditional or instructor-centered methodologies. Through the lens of more traditional methodologies, some participants expressed concern with providing students more control over their learning, and allowing students more flexibility and opportunities to monitor their progress:

> Robert: [Allowing students to gauge their progress] will be difficult because, generally, we have punctual assessment such as tests, as opposed to ongoing

> assessments [...] there would be a challenge of allowing the instructor to have as much flexibility as possible to work with students based on their needs…
>
> Judy: So I think it's very hard for a student to, since they don't know what is it that they are going to learn how to [do] at this point, [...] and start […] monitoring their own performance in the class.
>
> William: The area of an executive function [...] It kind of sounds and feels like it's in the area that's outside of my control standing in front of a classroom … and probably […] harder to conceptualize and harder to implement.
>
> William: I'm teaching language at such an elementary level that […] I've got one thought running through my mind. My students last semester asked if there were any online tools that would help, kind of a flash card learning tool kind of thing to help them learn the […] alphabet. I did stumble on something recently, but I didn't have it last semester when they were learning the alphabet. So that would be one instance of something.

Conclusions

In order to more proactively address the needs of SWDs, as well as all learners, faculty may consider adopting more inclusive methodologies in their instruction (Langley-Turnbaugh, et al., 2013; Orr, 2009). However, while a number of studies promote the need for faculty to integrate technology and multimodal instruction to meet the needs of SWDs (Higbee, 2008; Levy, 2009; Pellerin, 2013; Wilson & Wright, 2011), many faculty may continue to use text as the primary mode of delivery (Berberi et al., 2008) and maintain an instructor-centered view of technology (LaRocco, 2013). In an effort to encourage faculty to apply multiple modalities and design accessible instruction, institutions may adopt policies promoting standardized technical guidelines for accessibility. However, these standards may influence course development from the point of usability rather than learner engagement. As UDL is designed to address the learning needs of all students (Rose, 2006), it may serve as a viable framework for more effectively addressing the needs of learners in the margins, including SWDs.

By evaluating perceptions about technology-enriched UDL strategies, this study may provide insight into thought processes, experiences, and values that influence implementation of UDL and the ways in which faculty address the needs of SWDs. Relatively few studies have been conducted to explore the perceptions of faculty on UDL and the results of faculty development programs centered on UDL and inclusive teaching modalities (Izzo, 2008; Myers, 2008; Skinner, 2007). By examining the perceptions of faculty who participated in an online module that addresses UDL as a framework for the integration of digital tools, multimedia content, and flexibility in curriculum delivery (Meyer & Rose 2005), this study also revealed the need for future studies on UDL-focused PD in the postsecondary setting, as well as how such PD may impact faculty perceptions.

Based on previous literature and findings of related studies, it was anticipated faculty would demonstrate, after participating in UDL-focused PD: increased awareness of inclusive course design strategies; increased comfort in accommodating SWDs; increased understanding of the role of technology in UDL implementation; and expressed needs to redesign course content and curricula (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco et al., 2013; Spooner et al., 2007). As a result of participating in an online module on technology-enriched UDL strategies, as well as the subsequent line of questioning, participants generally:

- perceived the need to design flexible instruction that considers multiple learning variables (CAST, 2015);
- perceived the need to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007);

- demonstrated an increased awareness of learner variability and the needs of SWDs (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012);
- demonstrated an increased awareness of inclusive course design strategies (Higbee, 2008; LaRocco et al., 2013; Langley-Turnbaugh et al., 2013; Spooner et al., 2007);
- and demonstrated an increased awareness of learner diversity and ability to accommodate diverse learners (Scott & Edwards, 2012).

Also expressed by participants were a number of barriers to implementing technology-enriched UDL strategies, including: a lack of access to technology and funding (Okolo & Diedrich, 2014); the cost of purchasing appropriate technology (NCES, 2011); limited staff resources to provide training on accessibility issues (NCES, 2011); a lack of technology PD opportunities (Okolo & Diedrich, 2014); strain on academic departments and their resources (Skinner et al., 2011); and a lack of familiarity with UDL (Spooner et al, 2007). These findings were consistent with the literature and suggest UDL implementation could be hindered by such barriers and challenges; in order to maximize UDL-focused PD, it would be beneficial to research and identify the potential barriers to applying inclusive instructional strategies and UDL principles in a variety of contexts.

Recommendations

The focus of this study was on promoting the need for UDL as a domain of knowledge among faculty, and, subsequently, the need for UDL-focused PD opportunities. In general, participants indicated the online module had a positive impact on their perceptions. More studies should be conducted, however, to determine how faculty acquire and advance ideas related to UDL, technology integration, and inclusive

teaching practices. Likewise, based on the limitations of the study, it is suggested future studies be replicated with the following modifications in mind: (a) in order to effectively address faculty who are likely to teach SWDs and may perceive a need to address learner diversity, similar studies should be replicated to focus on the perceptions and practices of faculty who teach high-enrollment courses in which there may be a higher probability of SWD enrollment; (b) as participants indicated they may prefer to consider the needs of all learners rather than the needs of SWDs, it is recommended similar studies address UDL-focused PD that identifies UDL as a framework for addressing the needs of all learners, rather than explicitly addressing SWDs in the instruction; and (c) as this study was conducted with a sampling of faculty in only one academic department, it is recommended similar studies be conducted with a larger number of faculty, and a sampling of faculty in various academic areas, in order to generalize results to the target population.

Identified below are recommendations for future studies based on findings in the current study, findings not addressed by the study, and limitations of the study. As research on UDL in the postsecondary setting and faculty development is largely emergent, it should be noted many of the recommendations are based on a need for continued studies emerging from the research or a replication of the study in a variety of contexts. The following three sections explicate recommendations for future studies based on the need to (a) identify perceptions, (b) measure change in perceptions, and (c) measure the impact of UDL-focused PD on practice and student success.

Identifying perceptions. In addition, after completing the online module, participants perceived they were more aware of learner variability and were open to

modifying the way they design course materials. However, very few studies have highlighted the perceptions of faculty about UDL and how these perceptions influence practice; for this reason, it is recommended more studies be conducted that focus explicitly on identifying the perceptions of faculty about UDL and UDL-focused PD, as well as perceptions that may positively or negatively influence the implementation of UDL. Guiding questions for such studies on the impact of UDL-focused PD may address or measure: (a) the need to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented, (b) increased awareness of learner variability and the needs of SWDs, and (c) increased awareness of inclusive course design strategies. However, as previous studies have shown awareness of UDL does not necessarily result in actual changes to practice, such research should also observe the practice of and measure changes in the way faculty choose to design instruction and implement UDL after participating in UDL-focused PD opportunities.

Perceptions about accommodation. While previous literature suggested participants might perceive specific accommodations as a strain on academic departments and resources (Skinner et al., 2011), several participants indicated the accommodation process was one of the easiest approaches toward addressing the needs of SWDs. As the sampling of faculty may have not been representative of the broader population of faculty, more studies should be conducted to determine whether or not accommodations are perceived as burdensome among faculty and academic departments, and, subsequently, in what ways reliance on the accommodation process impact implementation of UDL and the need for UDL-focused PD.

Perceptions about technology. Although UDL promotes the use of technology as a way to facilitate cost effective, flexible ways to individualize learning (CAST, 2015), participants generally perceived technology would create barriers to learning and UDL implementation, such as a lack of funding and access to the appropriate technologies. Several participants additionally highlighted technology integration issues specific to the department and foreign language discipline. Future studies should be conducted across departments and a variety of academic areas to determine if the perceived barriers related to technology are consistent across the population of lower-division undergraduate faculty, or more specific to departmental needs.

Measuring change in perceptions. When asked to describe their perceptions of technology-enriched UDL strategies, each participant provided unique perspectives contextualized in their professional experiences and the needs of their students. Other than the benefits and barriers to UDL implementation, few themes emerged from this data. Despite inconsistencies in perceptions, after completing the module, participants generally perceived: (a) they would like to know more about the needs of their students, (b) technology is helpful toward UDL implementation, and (c) UDL is beneficial in general and provides a variety of benefits.

Perceptions about the needs of SWDs. When asked to describe the needs of SWDs, all participants perceived issues related to students not disclosing their needs. While faculty perceived they were appropriately supported in the accommodation process, they each expressed concern about a lack of knowledge about the needs of SWDs, and most participants perceived they were unable to meet those needs without

such support. This also suggests participants may have been interested in supporting students beyond the accommodation process.

Perceptions about technology-enriched UDL strategies. Likewise, when asked to describe their perceptions about the application of technology to meet the needs of SWDs, participants suggested technology would both remove barriers to learning and create barriers to UDL implementation. This suggests faculty perceived technology helpful in providing multiple modalities and flexible learning paths, but felt hindered by the limitations of technology**.** Findings indicated the online module may have had an impact on these perceptions, but the degree to which the online module had an impact was unclear. In order to determine how UDL-focused PD impacts faculty perceptions, and how such perceptions influence practice, future studies should be conducted with instruments designed to measure such change.

Perceptions about ability to accommodate diverse learners. Previous literature also suggested faculty may more explicitly demonstrate awareness of their ability to accommodate diverse learners after participating in PD centered on UDL and inclusive instruction (Scott & Edwards, 2012). However, findings suggested faculty perceived they were unfamiliar with how to meet such needs and relied on the accommodation process and centralized support services to determine the best approaches to meeting such needs. Future studies should be conducted with this disparity in mind to determine whether UDL-focused PD has an impact on faculty awareness of their ability to accommodate diverse learners, and the degree to which faculty rely on additional staffing and services to identify the learning needs of students. It is also possible faculty may perceive the accommodation process is no longer necessary when instruction is provided in an

accessible format; future studies should consider this change to determine how UDL-focused PD may impact perceptions about the accommodation process and the role of faculty in ensuring accommodations are made.

Measuring impact. In addition to highlighting the potential results of UDL-focused PD, as well as the benefits and barriers to implementing UDL as a domain of knowledge among faculty, this study also highlighted several key benefits related to UDL-focused PD and perceptions of such development opportunities. However, more studies should be conducted to determine in what ways such UDL-focused PD impacts the practice and the success of learners, and not just the perceptions of faculty.

Course design and practice. Based on reports in the literature, it was also anticipated participants may be more likely to apply inclusive teaching practices (Moreno, 2013); adjust the way courses are designed or delivered (Langely-Turnbaugh et al., 2013); and implement inclusive course design strategies (Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco et al., 2013; Spooner et al., 2007). While it is possible participants would demonstrate such practices as a result of participation in the online module, the study was not designed to measure how perceptions influence practice. However, faculty may not demonstrate awareness of UDL in the classroom, and there may be a disparity between faculty attitudes toward inclusive instruction and whether they authentically integrate inclusive practices in their teaching (Gawronski, 2014). For this reason, future studies should be conducted to determine in what ways UDL-focused PD may have an impact on the practices of faculty, and whether or not faculty are more likely to authentically apply inclusive course design strategies, or make changes to the way courses are designed, as a direct result of participation in such PD. Likewise,

additional studies should be conducted with a variety of PD approaches to further explore how different modalities and faculty-driven PD impacts knowledge and perceptions about UDL.

Student success. In addition, this study was not designed to measure the transition from UDL awareness to UDL implementation. However, there is evidence in the literature that, when implemented, such practices may have an impact on students in the following ways: narrowed grade distribution and withdrawal rates (McGuire, 2011); increased success rates (Scott & Edwards, 2012); clearer expectations; more flexibility; and perceived instructor approachability (Scott et al., 2010); increased engagement and interest (Smith, 2012); perceptions of increased opportunities to make choices and take control of their own learning (Kumar & Wideman, 2014); and agreement among students that learning is more readily achieved (Black et al., 2015). Future studies should also be conducted with the implications for student success in mind. These studies may also investigate in what ways UDL-focused PD leads to changes in course design, and, subsequently, impacts the success of diverse learners within the traditional classroom environment.

Implications

The focus of this study was on the emergence of faculty perceptions about the needs of SWDs, the application of technology to meet the needs of SWDs, and technology-enriched UDL strategies. The results of this study and related studies on faculty perceptions about UDL and UDL-focused professional development may hold implications for instructional practices and curriculum design, faculty professional development, and institutional policies supporting accessibility initiatives and guidelines.

By addressing UDL as professional knowledge, institutions may increase the likelihood of success for SWDs and diverse learners, raise standards for course design and technology integration, and increase awareness of learner variability among faculty. Likewise, addressing the UDL framework among accessibility standards may provide opportunities to more comprehensively address legal obligations for accessibility and efforts to provide equitable learning opportunities for all students.

Implications for curriculum design. "When education fails, the curriculum, not the learner, should take responsibility for adaptation" (Meyer & Rose, 2005, pp. 20). As UDL is designed to provide equal learning opportunities for all students, it may serve as a viable framework for the systematic design of inclusive curriculum. By applying UDL principles in the curriculum design process, course designers and developers may more systematically select and integrate appropriate technologies, and may be more likely to develop instructional goals, materials, and assessments that work for all students. By implementing UDL-focused PD and addressing UDL as a domain of knowledge among faculty, institutions may more effectively address analyses of key accessibility and variability issues; planning and design of flexible instruction and assessment methods, and development of student-centered instruction through a variety of technologies. Findings from the current study suggest curriculum designers and course developers should: apply UDL principles as a means of addressing the needs of all learners and not just SWDs; design instruction that addresses the individual learning needs of students, engages all learners, and encourages learners to self-regulate and gauge their progress; and select and integrate appropriate technologies that are flexible and encourage students to monitor progress and engage in self-regulation.

Analyses of learners. Studies have shown SWDs are often subject to anxiety and low confidence (Demuth & Smith, 1987; Downey & Snyder, 2001; Javorsky et al., 1992;), high withdrawal and dropout rates, and low expectations for graduation (Orr, 2009). However, when materials and technologies are aligned to UDL and provided in a format customized to the learner (Rose, 2000), students may perceive they have more control over their learning (Kumar & Wideman, 2014). Additional benefits may include narrowed grade distribution and withdrawal rates (McGuire, 2011); increased success rates (Scott & Edwards, 2012); clearer expectations; more flexibility; and perceived instructor approachability (Scott et al., 2010). Likewise, UDL offers a framework for engaging all learners, regardless of disability (Chita-Tegmark et al., 2012). Findings in this study suggest, according to the perceptions of the participants, SWDs may experience anxiety, hesitate to request accommodations, and experience difficulty focusing and participating in class. Findings also indicated participants perceived all students have learning differences, benefit from materials provided in multiple formats, and may benefit from accommodations such as extra time. Participants also suggested they preferred to consider the needs of all students rather than just needs of SWDs when discussing instructional methodologies. These findings suggest curriculum designers and course developers should apply UDL principles as a means of encouraging faculty to address the needs of all learners and understand how the needs of SWDs parallel the needs of all learners.

Planning and design. UDL promotes design of flexible instruction that takes into account multiple variables related to the context in which learning occurs (CAST, 2015). In addition, UDL promotes engaging students in active learning, with the goal of helping

all students become expert learners (Basham et al., 2013). Previous studies have also shown when materials and technologies are aligned to UDL, and materials are provided in a format customized to the learner (Rose, 2000), students may perceive they have more control over their learning (Kumar & Wideman, 2014). Participant responses in this study indicated they maintained a similar perception about UDL and suggested the framework provides a means of designing instruction that engages learners, allows learners to gauge their progress, and addresses learning from their own perspective. Participants also indicated they also perceived UDL as a way to align course design and materials to the needs of individual students. These findings suggest curriculum designers should apply the UDL principles of engagement when planning and designing instruction that addresses the individual learning needs of students.

Technology selection and integration. Multimedia content provides flexibility in curriculum delivery and opportunities to differentiate instructional practices (Meyer & Rose, 2005). Such technologies may help to promote flexible, cost-effective ways to individualize learning (CAST, 2015), and provide a format that can be customized to the learner (Rose, 2000). In addition, a number of studies have revealed the importance of digital technology in the inclusion and accommodation process (Hopkins, 2004).

While such studies promote the need for faculty to integrate technology and multimodal instruction to meet the needs of SWDs (Higbee, 2008; Levy, 2009; Pellerin, 2013; Wilson & Wright), many faculty may continue to use text as the primary mode of delivery (Berberi et al., 2008) and maintain an instructor-centered view of technology (LaRocco, 2013). Findings suggested participants did not always differentiate between which technologies would be most appropriate; however, they did report considering

multiple modalities in their instruction and flexible approaches to engaging students with technology. Several participants also considered applying technology to help students regulate their own learning, monitor progress, and engage in reflections. These findings suggest UDL principles should be applied when selecting and integrating appropriate technologies that are flexible and engage a broader audience of learners.

Implications for faculty professional development. Research initiatives in technology PD indicate advancements in technology skills alone are unlikely to lead to quality, student-centered technology integration. While accessibility policies mandate the use of assistive technologies to support the inclusion of students with disabilities, this is also built on an assumption that such technologies are a means to an end (Okolo & Diedrich, 2014). This may be paralleled by ineffective faculty development models, in which technology may be promoted as a comprehensive solution, rather than a tool to facilitate learning. However, technology cannot be a single solution to the challenge of meeting the needs of all learners, but must be contextualized in effective instructional practices (CAST, 2011). While research on the application of UDL is relatively recent, a number of studies have been conducted to explore the effects of faculty development and institutional support structures that explicitly address UDL. These studies have also indicated professional development focused on UDL principles is likely to result in increased awareness and application of inclusive teaching strategies and strategies for teaching with technology. Likewise, after being introduced to the UDL Guidelines, faculty may be more likely to design inclusive and accessible instruction proactively, rather than accommodating learners after instruction has been implemented. By examining the perceptions of faculty, this study suggests UDL-focused PD should be

implemented as a means of: (a) encouraging faculty to more explicitly address the individual needs of learners and involves students directly in the learning process; (b) encouraging faculty to design inclusive instruction, redesign course content to include multiple formats, and avoid more traditional, standardized assessment methods; and (c) aligning technology integration methods to the individual needs of learners, and address issues related to technology competencies among faculty and students.

Awareness of learner variability. Findings from studies on UDL suggest integration of inclusive practices may reduce reliance on the accommodation process (Kumar & Wideman, 2014). Based on previous literature and findings of related studies, it was anticipated faculty would demonstrate, after participating in UDL-focused PD, increased comfort in accommodating SWDs. Studies also suggest considering UDL may encourage faculty to address individual characteristics or disabilities which interfere with the learner's ability to access content, engage in a course, or demonstrate knowledge (Rose et al., 2006) and demonstrate an increased awareness of learner variability (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012). Findings in the study suggested, after participating in the online module, participants perceived the need to design flexible instruction that considers multiple learning variables (CAST, 2015), demonstrated an increased awareness of learner variability and the needs of SWDs (Langley-Turnbaugh et al., 2013; Moreno, 2013; Scott & Edwards, 2012). and demonstrated an increased awareness of learner diversity and ability to accommodate diverse learners (Scott & Edwards, 2012). Participants also considered the individual needs of their students, which characteristics of their students could be addressed through UDL, and considered strategies for incorporating feedback from students. These findings

suggest UDL-focused PD could be implemented as a means of encouraging faculty to more explicitly address the individual needs of learners and involve students directly in the learning process.

***Awareness of inclusive course design strategies*.** After participating in UDL-focused PD, faculty may be more likely to design inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007). In order to more proactively address the needs of all learners, faculty may also consider adopting more inclusive methodologies (Langley-Turnbaugh, et al., 2013; Orr, 2009). However, previous studies have shown faculty may also perceive UDL through an instructor-centered lens, and remain focused on the personal implications of UDL (LaRocco, 2013). Based on previous literature and findings of related studies, it was anticipated faculty would, after participating in UDL-focused PD, demonstrate increased awareness of inclusive course design strategies, and express needs to redesign course content and curricula. Responses from participants affirmed the online module may have encouraged proactive approaches to designing instruction over the accommodation process. Participants also perceived content should be presented in different formats and be proactively designed with all learners in mind. However, it appears some participants were thinking more traditionally about course design and inflexible approaches, such as the need for standardized assessments and expressed discomfort with allowing students to have more control over their learning, such as monitoring their own progress. These findings suggest UDL-focused PD should be implemented as a means of encouraging faculty to design inclusive instruction, redesign course content to include multiple formats, and avoid more traditional, standardized assessment methods.

Awareness of technologies and multiple modalities. Previous studies have shown that UDL-focused PD may lead to an increased frequency of multimodal delivery of instruction (Langley-Turnbaugh et al., 2013) and promotes the consideration of a technology-supported inclusive approach to meet the needs of all learners (Pellerin, 2013). Based on previous literature and findings of related studies, it was anticipated participants would, after participating in the online module, demonstrate an increased understanding of the role of technology in UDL implementation. Responses from participants indicated they considered the individual needs of students when asked about technology integration and UDL. However, they also expressed concerns about barriers to technology integration, such as a lack of technology competency among faculty and students. These findings suggest UDL-focused PD should align technology integration methods to the individual needs of learners, and address issues related to technology competencies.

Implications for institutional policy. Federal requirements mandate all SWDs be accommodated in cases where a student has self-disclosed a disability. For this reason, faculty must account for a diverse learner population when designing instruction. In addition, pressure from legislation and the ADA have driven faculty to examine the value of technology and multimodal instruction. Previous studies have indicated participating in UDL initiatives may foster and encourage approaches to designing accessible and inclusive instruction. However, as they may feel ill-prepared to work with SWDs, faculty may rely heavily on centralized support services to obtain assistance with accommodating students to identify and address the needs of their learners (Orr, 2009). Learning communities centered on addressing related campus-wide accessibility and

accommodation concerns have also emerged from the strategic implementation of faculty development on accessible course design (LaRocco & Wilken, 2013). This suggests institutional policies and structure may result in the development of new support programs and more effective PD opportunities (Scott & Edwards, 2012). Likewise, findings from the current study and related studies suggest institutional policy and accessibility guidelines: (a) promote awareness of the most prominent disability types, such as specific learning disabilities and ADD/ADHD, (b) encourage proactive and accessible course design strategies as an alternative to the accommodation process, and (c) consider the cost associated with inclusive course design and allocate resources and technologies accordingly.

Learner variability issues. The needs of SWDs may not always be clear, as SWDs may not always request accommodations due to self-perceptions of their disability (Scott et al., 2010) or may choose to leave such needs undisclosed to faculty, such as learning disabilities (Orr, 2009). Findings in the literature also suggest such students face significant challenges and barriers in the traditional classroom, are subject to anxiety and low confidence (Demuth & Smith, 1987; Downey & Snyder, 2001; Javorsky et al., 1992), and may suffer embarrassment, stress, and anxiety due to complications with speech articulation and auditory processing (Scott et al., 2010). Likewise, students who are not asked to disclose learning needs at the beginning of a course may be less likely to perceive the instructor as creating a positive learning environment (Scott et al., 2010); even when accommodation are made, such they may not always match the needs of some students (Black et al., 2015). To address these key variability issues, current literature suggests faculty provide UDL supports that are accessible to all learners, not just those

with disabilities (Rose, 2006). Findings suggested participants did not demonstrate awareness of the broad variety of the types of disabilities and learners within their classroom. In addition, several participants expressed a lack of knowledge regarding how to identify the needs of a variety of learners, and were not confident about their ability to meet the needs of SWDs without direct support from disability services and the accommodation process. These findings suggest institutional policy and accessibility guidelines should promote awareness of the most prominent disability types, such as specific learning disabilities and ADD/ADHD and dissuade faculty from relying solely on the accommodation process as a means of addressing unique learner needs.

Curriculum design issues. Previous studies have shown faculty, as they may feel ill-prepared to work with SWDs, tend to rely on centralized support services in order to accommodate students (Orr, 2009). In an effort to encourage faculty to apply multiple modalities and design accessible instruction, institutions may adopt policies promoting standardized technical guidelines for accessibility. However, these standards may influence course development from the point of usability rather than learner engagement. Likewise, even when the needs of SWDs are known, accommodations may not always match the needs of some students (Black et al., 2015); for this reason, faculty should consider providing instruction proactively in an accessible format. Findings in this study suggest institutional policy and accessibility guidelines should encourage proactive and accessible course design strategies as an alternative to the accommodation process. Findings also suggested participants perceived a number of barriers to implementing technology-enriched UDL strategies, including: a lack of access to technology and funding; the cost of purchasing appropriate technology; limited staff resources to provide

training on accessibility issues; and a strain on academic departments and their resources. This suggests institutional policies should consider the cost associated with inclusive course design, and allocate resources and technologies accordingly.

Implications for technology-enriched UDL strategies in foreign languages. Foreign languages continue to remain a requirement at many postsecondary institutions; such requirements have resulted as a means of meeting global demands for professions and communication skills (Scott et al., 2010). As bilingualism or multilingualism may be necessary to remain competitive in a global environment, foreign languages will likely remain a requirement for all learners, regardless of disability (Scott et a1., 2000). However, literature suggests SWDs may be subject to anxiety and persistence in foreign language courses and, despite awareness of this issue, little may be known about strategies for accommodating diverse learners in the foreign language classroom (Ofies, 2007). However, findings in this study suggest these issues may be overcome by aligning technology selection and integration to the UDL framework. By doing so, foreign language instructors may more proactively address the specific learning needs of SWDs and diverse learners.

Overall Conclusion

Few studies have highlighted the impact of UDL-focused PD on the perceptions of faculty and the application of UDL as a means of meeting the needs of SWDs in the postsecondary setting. Likewise, as students vary in their strengths, digital media provides a format that can be customized to the learner (Rose, 2000). Such multimedia and digital content provide flexibility in curriculum delivery and opportunities to differentiate instructional practices (Meyer & Rose, 2005). In an effort to contribute to a

growing body of knowledge about the impact of such PD on faculty perceptions about UDL and technology integration, this study aimed to identify the potential impact of an online PD module on the perceptions of faculty about the needs of SWDs, the application of technology to meet the needs of SWDs and all learners, and the application of technology-enriched UDL strategies.

This study revealed faculty perceptions related to the following three themes: awareness of learner variability and challenges faced by SWDs, benefits and barriers of applying technology-enriched UDL strategies, and the impact of UDL-focused PD on perception and practice. Findings suggested, after participating in an online module on technology-enriched UDL strategies, participants perceived:

- SWDs need to be accommodated, but may not always disclose learning needs;
- SWDs and all learners need materials in multiple, accessible formats;
- technology reduces barriers to learning;
- technology enables customization and self-regulation of learning;
- and technology-enriched UDL strategies are helpful.

Findings also indicated the online module on technology-enriched UDL strategies may have had an impact on these perceptions. Likewise, as a result of familiarity with the UDL framework, findings suggested participants considered designing inclusive instruction proactively, rather than making accommodations after instruction has been implemented (Spooner et al., 2007), demonstrated a greater awareness of learner variability and the needs of diverse learners (Scott & Edwards, 2012; Langley-Turnbaugh et al., 2013; Moreno, 2013), and demonstrated greater awareness of inclusive course

design strategies (Higbee, 2008; Higbee, 2008; Langley-Turnbaugh et al., 2013; LaRocco & Wilken, 2013; Spooner et al., 2007).

Based on these findings, as well as the limitations and delimitations of this study, a number of recommendations are provided for future studies and replications of similar studies within the domain of UDL in the postsecondary setting. Such studies may identify the impact of UDL-focused PD on:

- perceptions about the accommodation process and the design of accessible instruction;
- ability to accommodate diverse learners and identify the learning needs of a diverse student population;
- perceptions about technology integration, as well as benefits and barriers to technology integration;
- ideas for course redesign and the application of inclusive course design strategies;
- and curricular adjustments that explicitly address UDL guidelines and increase opportunities for diverse learners to be successful.

Results of such studies may also help to: (a) communicate the need for UDL-focused PD in the postsecondary setting; (b) promote UDL, among accessibility standards and guidelines, as a domain of knowledge for faculty; and (c) promote UDL as a means of proactively designing learning environments and reducing dependency on the accommodation process.

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Appendix A

Interview Preparations and Protocol

Interview Preparations

Materials

- Digital recorder with microphone and charger
- Backup digital recorder with microphone
- Extra batteries for recorder
- Printed copies of interview protocol/questions
- Digital copy of consent form

Before the Interview

1. Confirm the time and location for interview.
2. Send calendar invitation for scheduled interview time.
3. Test any applications that will be used to record interviews.

Day of the Interview

1. Ensure primary recording device is charged and working.
2. Ensure backup recorder is working.
3. Document the following information prior to interview:
    a. Confirmation of completion of consent form
    b. Interviewee Pseudonym/Code (Participant A, B, C, D, E)
    c. Interviewer
    d. Time
    e. Day
    f. Date
    g. Location
4. Confirm permission to record.
5. Read protocol to participants prior to beginning interview.

Interview Protocol

Thank you for agreeing to take part in this study. Your participation will be valuable to research on the perceptions of faculty about Universal Design for Learning and technology integration in the postsecondary classroom.

In order to take notes during our interview, I will be recording our conversation today. If you have not yet done so, please complete the consent form that was sent to you prior to the interview. For your information, I will be the only researcher on this project that will have access to the recordings which will be deleted as soon as they are transcribed.

I have planned this interview to last no longer than one hour. During this time, I will cover several questions, some of which will be related to the topics discussed in the online module you completed. If time begins to run short, it may be necessary to interrupt the discussion to complete the line of questioning.

Do you have any questions?

Interview Introduction

You have been selected to speak with me today because you have been identified as faculty who teach lower-division undergraduate language courses at the site of study. The focus of this research project is on perceptions of faculty about about the needs of students with disabilities; the application of technology to meet the needs of students with disabilities; considerations for applying technology to meet the needs of students with disabilities; and overall perceptions about technology-enriched Universal Design for Learning strategies.

For the purposes of this interview, the term "students with disabilities" includes the following disability types:

- Specific learning disabilities, which is the most prominent disability type;
- attention deficit disorder / attention hyperactivity deficit disorder;
- as well as other less prominent disabilities such as: difficulty seeing, difficulty hearing, mobility limitations, and other health impairments.

Do you have any questions before we begin the interview?

Interview Questions

Lead Question 1. Describe your overall thinking about the needs of students with disabilities.

Follow-up Questions:

A. In your opinion, which of these needs (of students with disabilities) are faculty likely to face in their courses?
B. In your opinion, which kinds of needs are students with disabilities likely to disclose?
C. In your opinion, in what ways do the needs of students with disabilities parallel the needs of all students?

Lead Question 2. Imagine you have been asked to speak at a faculty meeting in your department about the needs of students with disabilities.

Follow-up Questions:

A. How would you describe the needs of students with disabilities to your faculty?
B. Which needs do you feel would be the most important to address with your colleagues, and why?
C. Which needs do you feel would be the least important to address with your colleagues, and why?

Lead Question 3. In what ways do you feel the needs of students with disabilities influence you and your teaching?

Follow-up Question:

A. In your opinion, which of these needs is the most difficult for you to address and why?
B. In your opinion, which of these needs is the easiest for you to address and why?

Lead Question 4. What kinds of tools and technologies do you feel are needed in order to meet the needs of students with disabilities?
Follow-up Question:

A. In your opinion, in what ways could the application of these technologies positively impact students with disabilities?
B. How do you know this?

Lead Question 5. Do you feel technology enables you to customize the learning experience for students with disabilities?
Follow-up Question:

A. Why or why not?
B. What experiences have led you to this conclusion?

Lead Question 6. Do you feel technology makes it easier to address the needs of students with disabilities?
Follow-up Questions:

A. Why or why not?
B. What experiences have led you to this conclusion?

Lead Question 7. Share 1-2 technology-enriched lesson ideas that you can use in your courses to better address the needs of students with disabilities.
Follow-up Questions:

A. What UDL strategies might you apply in each lesson to make it more accessible?
B. What kinds of tools and technologies would assist you in applying these strategies?

Lead Question 8. Describe a current lesson that could be made more accessible to students with disabilities through the application of technology.
Follow-up Questions:

A. What would you change about this lesson, and why?
B. In what ways would this change positively impact students with disabilities?
C. In what ways would this change positively impact all of your students?

Lead Question 9. Describe your overall perception of UDL as a framework for addressing the needs of students with disabilities.
Follow-up Questions:

A. Which aspect of the UDL framework do you feel is most useful, and why?
B. Which aspect of the UDL framework do you feel is the most challenging to address, and why?

Lead Question 10. In your opinion, what are the benefits to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?

Lead Question 11. In your opinion, what are the barriers to applying technology-enriched UDL strategies to meet the needs of students with disabilities, and why?

Appendix B

Email to Solicit Participants

Dear [Insert Faculty Name],

I am conducting a study on technology-enriched Universal Design for Learning (UDL) strategies in the postsecondary classroom. Specifically, I am looking at faculty perceptions of the needs of students with disabilities (SWDs), the application of technology to meet these needs, and overall perceptions of technology-enriched UDL strategies as a means of addressing the needs of SWDs. If you would like to participate in this study, please take a few minutes to review and respond to the attached informed consent form.

By participating in this study, you may develop a better understanding of technology-enriched strategies for meeting the needs of SWDs. Likewise, this study will contribute to research by providing valuable insight into the current practices of faculty who teach SWDs, and ways in which technology can be used more proactively to address the needs of SWDs in the postsecondary classroom.

Participation in this study is completely voluntary. Please let me know if you have any questions. Your consideration of this study is greatly appreciated.

Sincerely,
[Name of Lead Investigator]
Lead Investigator
[Email]

Appendix C

Consent to Participate in a Research Study

TECHNOLOGY-ENRICHED UDL STRATEGIES: PERCEPTIONS OF FOREIGN LANGUAGE FACULTY

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about Technology-Enriched UDL Strategies: Perceptions of Foreign Language Faculty because you currently teach or have taught lower-division undergraduate language courses at [the site of study].

WHO IS CONDUCTING THE STUDY?

The person in charge of this study is [name of lead investigator] of [site of study] Department of the Instruction and Curriculum Leadership Department. She is being guided in this research by [name of chair] Associate Professor, Instructional Design and Technology, along with other consulting faculty.

WHAT IS THE PURPOSE OF THIS STUDY?

Through this study, the researchers hope to learn how the implementation of an instructional intervention, *Technology-Enriched UDL Strategies*, impacts the perceptions of foreign language faculty on accessibility issues, the needs of students with disabilities (SWDs), and the application of technology to address the needs of SWDs. We also hope to identify the general perceptions of foreign language faculty on Technology-Enriched UDL Strategies as a framework for inclusive teaching with technology.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research will be conducted through the University of Memphi. Your participation will be conducted both online and face-to-face, through participation and interaction in an online module, and one scheduled face-to-face meeting with the research investigator at the conclusion of the module. From initiating participation in the study to completion, it is anticipated you will devote approximately 3-5 hours.

WHAT WILL YOU BE ASKED TO DO?

You will be asked to enroll in a self-paced online module titled Technology Enriched UDL Strategies and participate in the online activities and assessments included in the 1 ½ hour module. At the conclusion of the module, you will participated in a 2-phase semi-structured interview process in which you will be asked a series of questions about your perceptions and ideas related to the topic. The anticipated timeframe for each phase of the interview is approximately one hour.

WHAT ARE THE POSSIBLE RISKS?

Participation in this study imposes little to no risks to you as the participant. During the study, you may be asked to discuss your experiences as an instructor, including barriers you may face in the classroom. However, any identifiable information will not be documented during the data collection process as to ensure complete anonymity.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

The researcher will make every effort to keep private all research records that identify you to the extent allowed by law. Your information will be combined with information from other people taking part in the study. When writing about the study to share it with

others, the researcher will write about the combined information gathered. You will not be personally identified in these written materials. The researcher may publish the results of this study; however, she will keep your name and other identifying information private.
The researcher will make every effort to prevent anyone who is not participating in the research from knowing that you gave us information, or what that information is. Upon consenting to the study, any identifiable data will be deleted from records including emails and forms submitted to indicate interest in the research. Upon initiating the study, you will be assigned a non-identifiable code to apply during the data collection process, and your name will not be documented during data collection. Both identifiable and non-identifiable data will be maintained on a secure external hard drive and locked in a secure cabinet.

CAN YOUR TAKING PART IN THE STUDY END EARLY?
If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study. The individual conducting the study may need to withdraw you from the study. This may occur if you are not able to follow the directions given, if the researcher finds that your participation in the study is more risk than benefit to you, or if the agency funding the study decides to stop the study early for a variety of scientific reasons. There are no consequences for withdrawing from the study.

ARE YOU PARTICIPATING OR CAN YOU PARTICIPATE IN ANOTHER RESEARCH STUDY AT THE SAME TIME AS PARTICIPATING IN THIS ONE?
You may take part in this study if you are currently involved in another research study. It is important to let the investigator know if you are in another research study. You should also discuss with the investigator before you agree to participate in another research study while you are enrolled in this study.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?
Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator. If you have any questions about your rights as a volunteer in this research, contact the Institutional Review Board staff. We will give you a signed copy of this consent form to take with you.

WHAT IF NEW INFORMATION IS LEARNED DURING THE STUDY THAT MIGHT AFFECT YOUR DECISION TO PARTICIPATE?
If the researcher learns of new information in regards to this study, and it might change your willingness to stay in this study, the information will be provided to you. You may be asked to sign a new informed consent form if the information is provided to you after you have joined the study.

Your consideration as a participant in this study would be greatly appreciated, and will contribute to a growing body of research on best practices for addressing accessibility in the postsecondary setting.

Best Regards,
[Name of Lead Investigator]
Doctoral Candidate
Instructional Design and Technology
[Email]